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A DISCUSSION OF TYPES OF WEATHER IN MADRAS

BY

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Continued on page iii of this cover.

IV—A discussion of types of Weather in Madras.

by R. Ll. JONES, M.A., *Meteorologist, Madras.*

EXPLANATORY NOTE.

This public[illegible] contains a series of [illegible] 8 A.M. pressure distributions which accompany and are peculiar to different kinds of weather in the south of the Madras Presidency. The charts have been selected from the Madras Daily Weather Report and the collection has been named "Types of Madras Weather." This series was shown, some time ago, at a meeting of the South Indian Branch of the British Medical Association, and several applications have been made to me since for copies. As no copies were available it has been decided to publish them; short explanatory notes are added. Reference to these types may perhaps help to a better understanding of the Daily Weather Report in which the summary has of necessity to be short and technical.

Another remark must be added in explanation. Anyone who systematically compares the types here given with the charts and data in the Daily Weather Report will find many apparent exceptions to the relations here pointed out, and he may conclude that these relations are to a large extent illusory. It must be remembered however that the actual temperature, humidity, etc., which obtain when a pressure distribution of a given kind exists are the result of the changes produced by the establishment of that pressure distribution, combined with pre-existing conditions. These pre-existing conditions may be so large and abnormal that the relations here described may be completely masked in the *result*. This fact alone has made it necessary to exercise considerable care in selecting suitable charts for this publication.

Before entering into detail about the different kinds of weather distributed according to the months of the year it may be as well to define, first of all, the chief and most important types corresponding to the four seasons. These are—

(1) the cold weather type,
(2) the hot weather type,
(3) the south-west monsoon type,
(4) the north-east monsoon type.

The periods of the year during which these different kinds normally prevail are (for Madras and the Carnatic)—

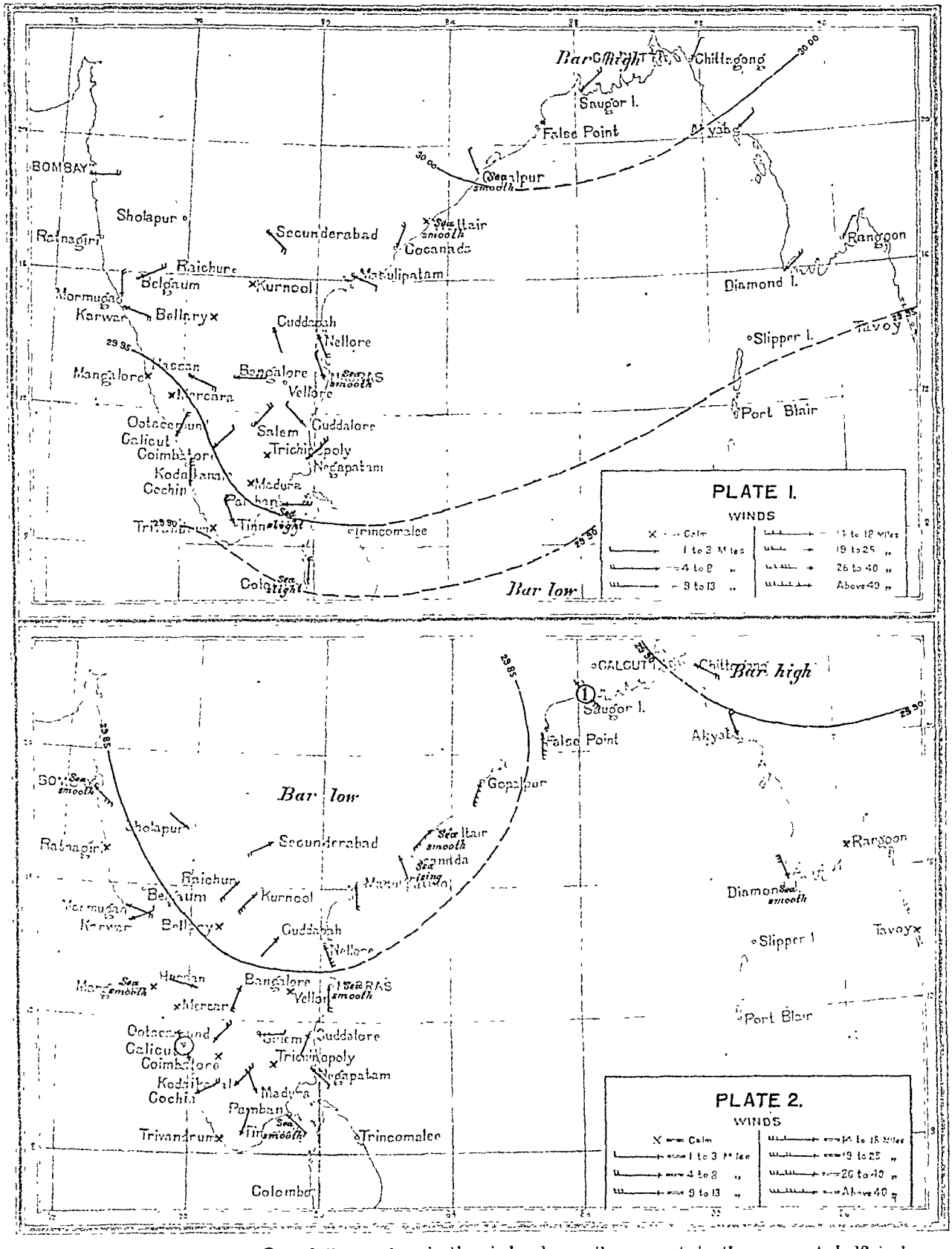
(1) the end of December to the end of February,
(2) the beginning of March to the end of May,
(3) the beginning of June to the first week in October,
(4) the second week in October to the third week in December.

These periods differ slightly for different places, but for the part of the Presidency referred to the above dates are approximate and fairly representative.

These types constantly recur and are closely associated with pressure distributions of a particular kind. Certain alterations in these pressure distributions are almost always accompanied by definite alterations in temperature, winds, humidity, etc. The object of these charts and notes is to call attention to these relations, and before this can be done in detail the chief or principal types must be defined.

Plate 1 which is the actual 8 A.M. pressure distribution on 28th January 1900, shows a normal cold weather distribution. When a distribution of this kind persists weather is fine throughout with very little cloud, and nights are cool. Pressure is highest in the Deccan and north of the Bay and lowest in Ceylon, with, steady north-easterly winds. The hottest area in the Peninsula during the persistence of this type of distribution includes the southern districts of Trichinopoly, Madura and Tinnevelly.

Plate 2 (9th April 1903) shows an approximately normal hot weather distribution. The characteristics of the weather at this period are briefly as follows. Inland temperature is very high and increases rapidly with the season. The hottest area, now includes the Ceded Districts and Deccan and has thus moved northwards since the preceding cold weather. At coast stations it is cooler. The air movement over the south of the Peninsula shows an indraught from the surrounding sea area towards the hot interior. At coast stations humidity is high, while inland it is low and the air is very dry. Winds are very strong during the day hours on the east coast, in fact stronger on the average than at any other period of the year; inland, where the air movement is largely ascensional, they are light; at Bangalore for instance there is a minimum in April. Weather is generally fine, interrupted occasionally by thunder-storms which are of most frequent occurrence in the neighbourhood of the hills. These hot weather storms are generally accompanied by a sudden increase in pressure.

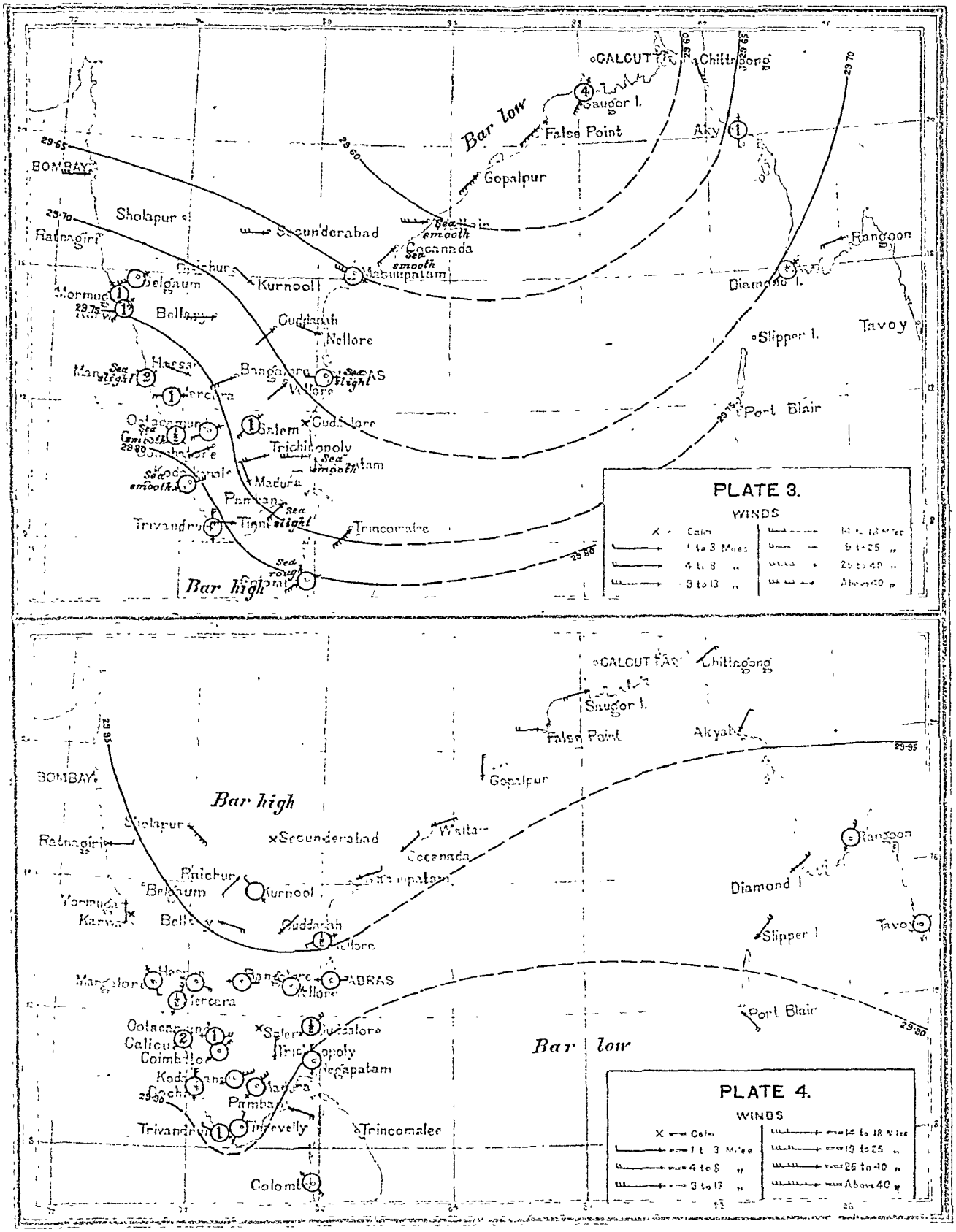


Rainfall is shown by a ○ and the number in the circle shows the amount to the nearest half inch.

Plate 3 (27th June 1901) is a normal south-west monsoon distribution. A distribution of this type is usually attended by cloudy rainy weather on the west coast and over the north of the Peninsula, and south-westerly winds over the whole of the Presidency. Temperature is low and uniform and the daily range is small on the west coast. In the Carnatic there is very little rain except in the higher elevations. Here the weather is still hot and fine except for occasional rain squalls, and is hottest on the Madras coast. Temperature falls as the season advances and rain squalls become more frequent. The hot weather, judging by temperature conditions alone, is later in setting in on the Madras coast than inland, but it persists to a later period in the year.

Plate 4 (5th October 1905) shows a north-east monsoon distribution. In this distribution pressure is lowest in the south-west of the Bay, and is high in the Deccan and the north of the Bay. Northerly to easterly winds prevail over the land area, and south-westerly winds (the south-west monsoon) are still blowing in the south of the Bay. At Port Blair wind is frequently south-easterly, and it forms part of the south-west monsoon movement curving in over the Bay towards the Madras coast, instead of proceeding northwards into Bengal and Burma as in the previous months. These winds bring cloudy weather and rain over the south of the Presidency. The rainfall is generally lighter inland than at coast stations. Temperature falls suddenly with the burst of the north-east monsoon, the daily ranges become small, and humidity is very high.

This distribution may appear to be very similar to the cold weather distribution in Plate 1, and the difference between the two is not very clear in the plates which only show the results of observations at meteorological observatories on the dates mentioned. In the cold weather distribution the area of lowest pressure is to the south of Ceylon and north-easterly winds prevail throughout. In the north-east monsoon distribution on the other hand pressure is lowest in the south-west of the Bay, and the south-west monsoon is still blowing into the Bay.



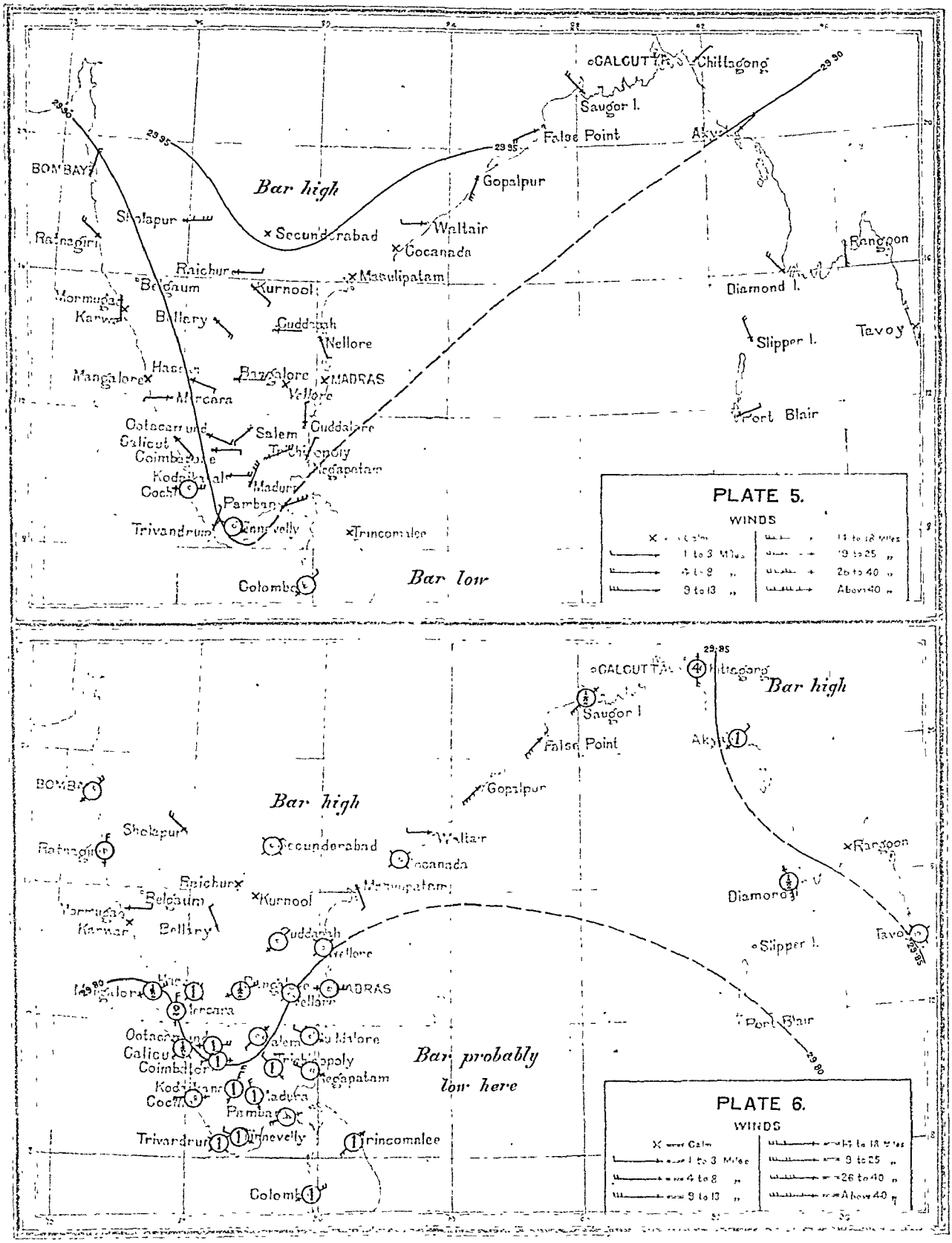
Rainfall is shown by a ○ and the number in the circle shows the amount to the nearest half inch.

These four charts (Plates 1 to 4) show the distinctive features of the pressure distribution that most frequently recur and are most persistent during each of the four seasons of the year. They are accompanied by the weather conditions which have been briefly described in the foregoing pages. These distributions are not of course rigidly restricted to the periods named on page 53, but they are typical of these periods. When a type of distribution becomes established at a time of the year which is well outside its proper period, abnormal weather for that season will accompany it and the change that will take place can, in its broad features, be safely inferred.

For instance, Plate 5 shows the pressure distribution which obtained at 8 A. M. on 31st March 1907, a date well within the hot weather period. This distribution is of the cold weather type, and as long as it lasted maximum and minimum temperatures were much below the average in the north of the Presidency, and the mean was 5° to 6° lower than usual.

Again on the 16th August 1906 the pressure distribution was that shown in Plate 6 and this is distinctly of the north-east monsoon type. During this time easterly winds with rain squalls set in on the Madras coast and showers were received over the greater part of the Carnatic, conditions which brought about a large fall in temperature. In fact the weather at this time on the Madras coast resembled that which prevails just at the commencement of the north-east monsoon in October.

Such abnormal conditions as these are large and of comparatively rare occurrence, and it is comparatively easy to infer the effect they are likely to produce. The change however from one type to the other takes place as a rule much more gradually and as the year advances. In order to appreciate these it is necessary to consider the normal and the most important abnormal weather types, and their pressure distributions for each month of the year.



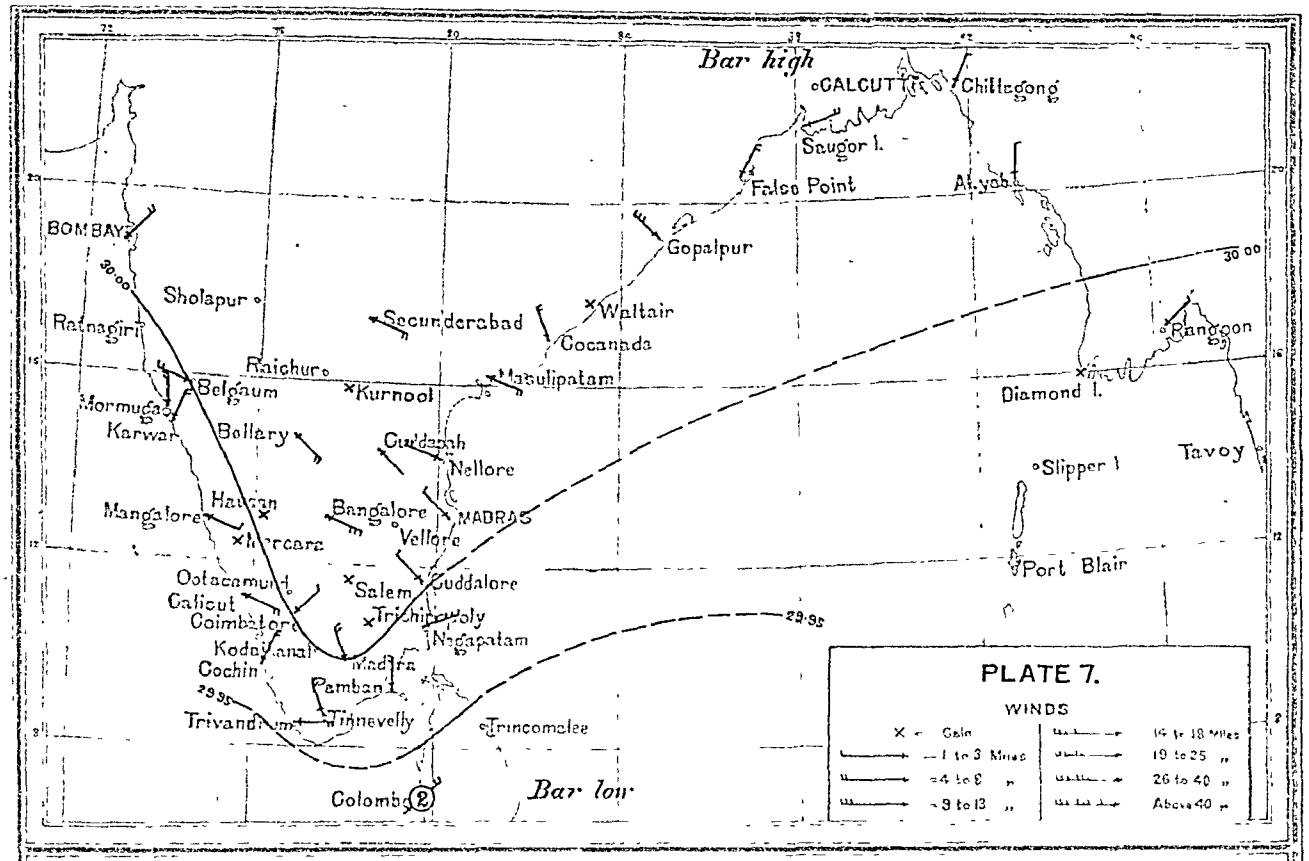
Rainfall is shown by a ○ and the number in the circle shows the amount to the nearest half inch.

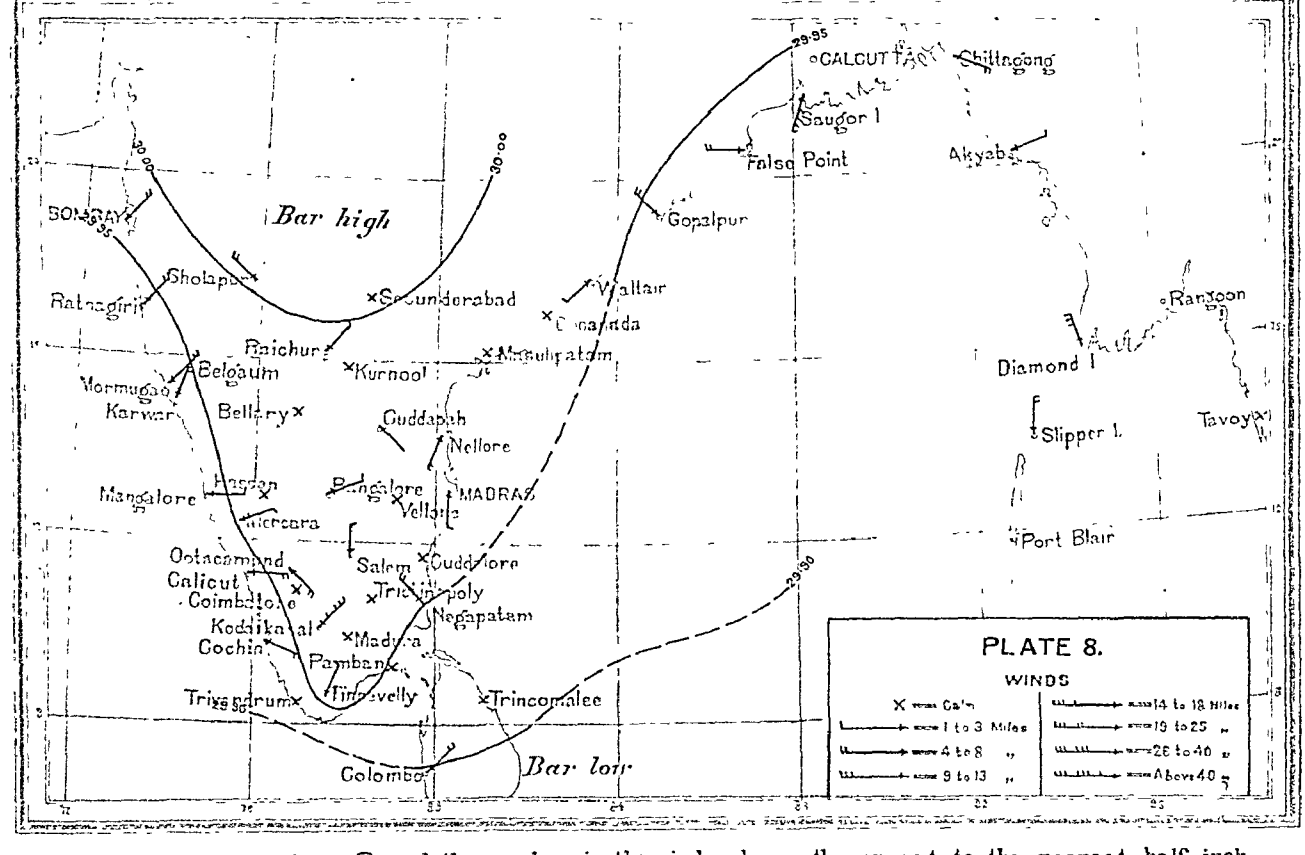
JANUARY.

A normal pressure distribution for January is shown in Plate 1 and a general description of the normal weather conditions accompanies it. There are however at least three well marked and important variations from this normal type, each of which is almost invariably accompanied by pronounced abnormal weather conditions.

Plate 7 (14th January 1900) shows a pressure distribution abnormal in that pressure is absolutely and relatively much higher in Bengal than elsewhere. When this type obtains it is generally accompanied by higher night temperatures than usual over the south of the Presidency and there is more cloud than usual also. Day temperatures are sometimes but not generally in defect (see D. W. R. 13th January 1904). Probably the reason why high pressure in Bengal is attended by high night temperatures in Madras is, that when this distribution obtains winds are more easterly at Madras and over the Bay than usual. The air having moved over a more extensive sea area than usual contains more vapour. Actual comparisons show this to be the case. Under these conditions radiation during the night hours is checked and higher minima than usual result.

Plate 8 (26th January 1907) shows a distribution with pressure highest in the Deccan and steeper gradients than usual over the Peninsula. This type is attended by cooler nights than usual; in the case referred to the minimum was over 5° F. below normal in Madras and at many other stations in the Carnatic. A similar distribution which may be referred to is that reported on 29th January 1905. The physical explanation of this follows from what has been said in the previous case.





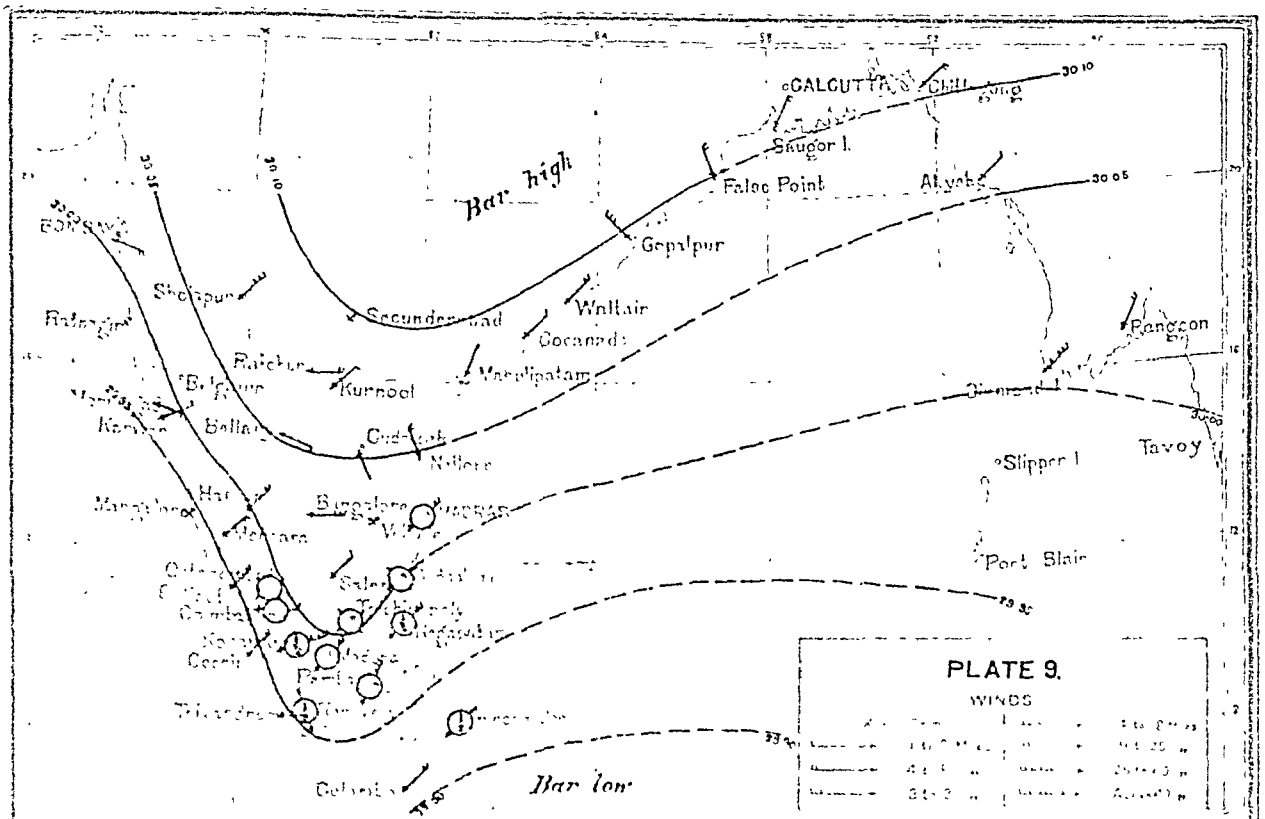
Rainfall is shown by a ○ and the number in the circle shows the amount to the nearest half inch.

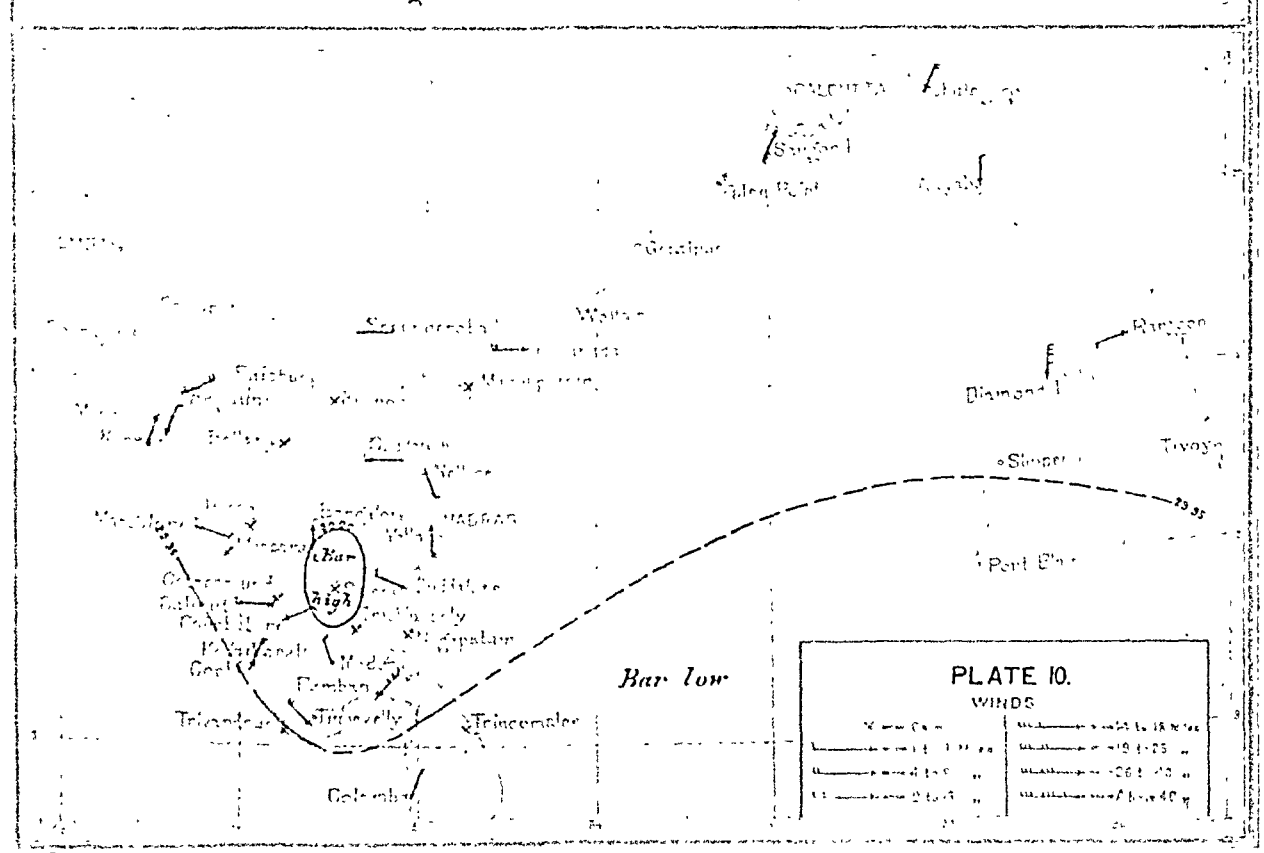
Showers, known as "Pongal showers", are occasionally received at Madras during January. These are attended by a particular type of pressure distribution which is shown in Plate 9 (12th January 1904). In these cases pressure is, relative to normal, higher in Burma than on the Madras coast and a temporary low pressure area forms in the south-west of the Bay. This type is really a "north-east monsoon" type and the meteorological conditions that determine these well known showers appear to be identical with those that determine the "north-east monsoon" rains during October, November and December. A similar case in which the depression in the Bay is most clearly shown is that reported on the 16th January 1906. On this occasion very heavy rain fell over the whole of the Carnatic, and it had this peculiarity that the rainfall was heavier inland than at the coast stations.

FEBRUARY.

In this month the distribution is still of the cold weather type with pressure highest in the north and lowest in the south. Gradients are not so steep and winds are not so steady or strong; at Madras the normal wind direction is easterly and the daily velocity is a minimum in this month.

Plate 10 (10th February 1900) shows an approximately normal distribution. Cloud and humidity decrease during this month. When gradients become steeper conditions typical of January prevail, and as a rule temperature becomes lower. The abnormal weather conditions, attending high pressure in the Deccan and Bengal are the same as in January.





Rainfall is shown by a ○ and the number in the circle shows the amount to the nearest half inch.

Occasionally with unusually high temperatures in the Ceded Districts, strong indraught from the surrounding seas is set up towards the interior even in February. These conditions are characteristic of the hot weather. When they occur in February they are followed by disturbed weather and rain.

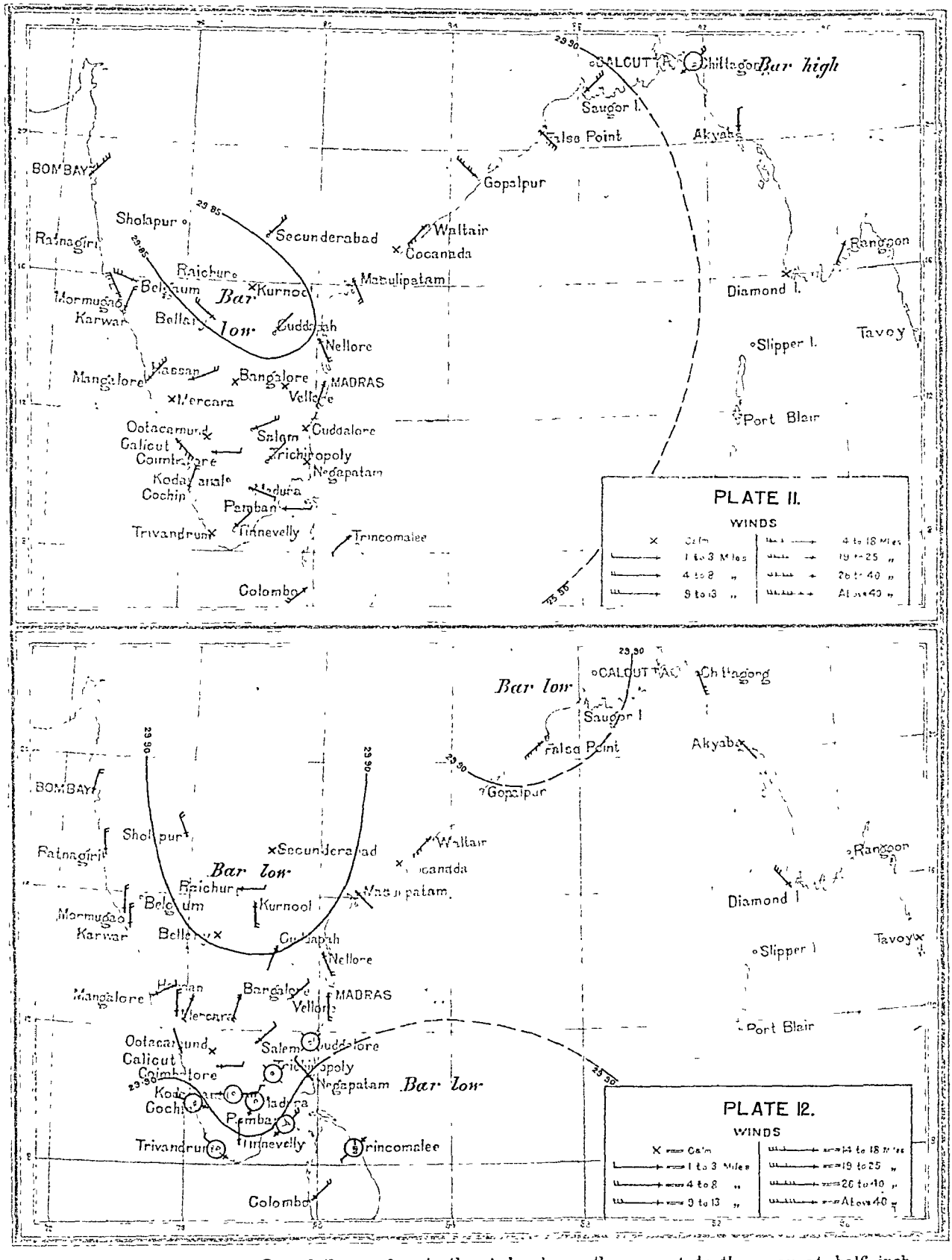
Plate 11 (11th February 1901) shows such a distribution. Very strong and damp southerly winds were blowing on the Madras coast during this day; these carried in a large amount of water vapour into the interior. This was followed by unsettled weather and Masulipatam received 3 inches of rain during the next twenty-four hours Kurnool, Nellore, Vellore and Bangalore light showers.

MARCH AND APRIL.

These two months are considered together because they belong to the same period, and because the chief feature of the normal pressure distribution at 8 A. M. is its great uniformity. During March pressure is perhaps slightly higher on the whole in the Carnatic than in the surrounding areas, and the hottest area is in the Ceded Districts. During the day this uniformity disappears and the area of highest temperature becomes the area of lowest pressure also The same is true of April, but the high pressure area in the Carnatic has almost disappeared and the low pressure area in the north of the Presidency is more marked. Plate 2 (9th April 1903) shows an approximately normal distribution. South-easterly winds blow on the Madras coast during the period and become very strong during the day. As the year advances these winds become more southerly and damper, and when they blow directly or nearly directly from south they are very damp and unpleasant and are well known as the "long shore" winds. There can be little doubt that they derive some of their moisture from having to pass when blowing from this direction through miles of space filled with fine spray thrown into the air by the heavy surf that beats on the coast at this season, for slightly further inland the winds are not nearly so damp and disagreeable. They carry large quantities of moisture inland and, meeting with dry winds from the interior, give rise to thunderstorms and showers which are heavier on the hills than on the plains. One example of this has already been given in Plate 11.

The showers at this season are known in the coffee-growing districts as the "blossom showers,"* and are partly at any rate due to the causes just explained. But in the extreme south other causes frequently bring them about, *viz.*, the formation of a low pressure area in the neighbourhood of Ceylon which appears to bring in damp winds of oceanic origin from equatorial regions. Plate 12 (11th April 1905) is an example.

* "Margo showers" in the plains.



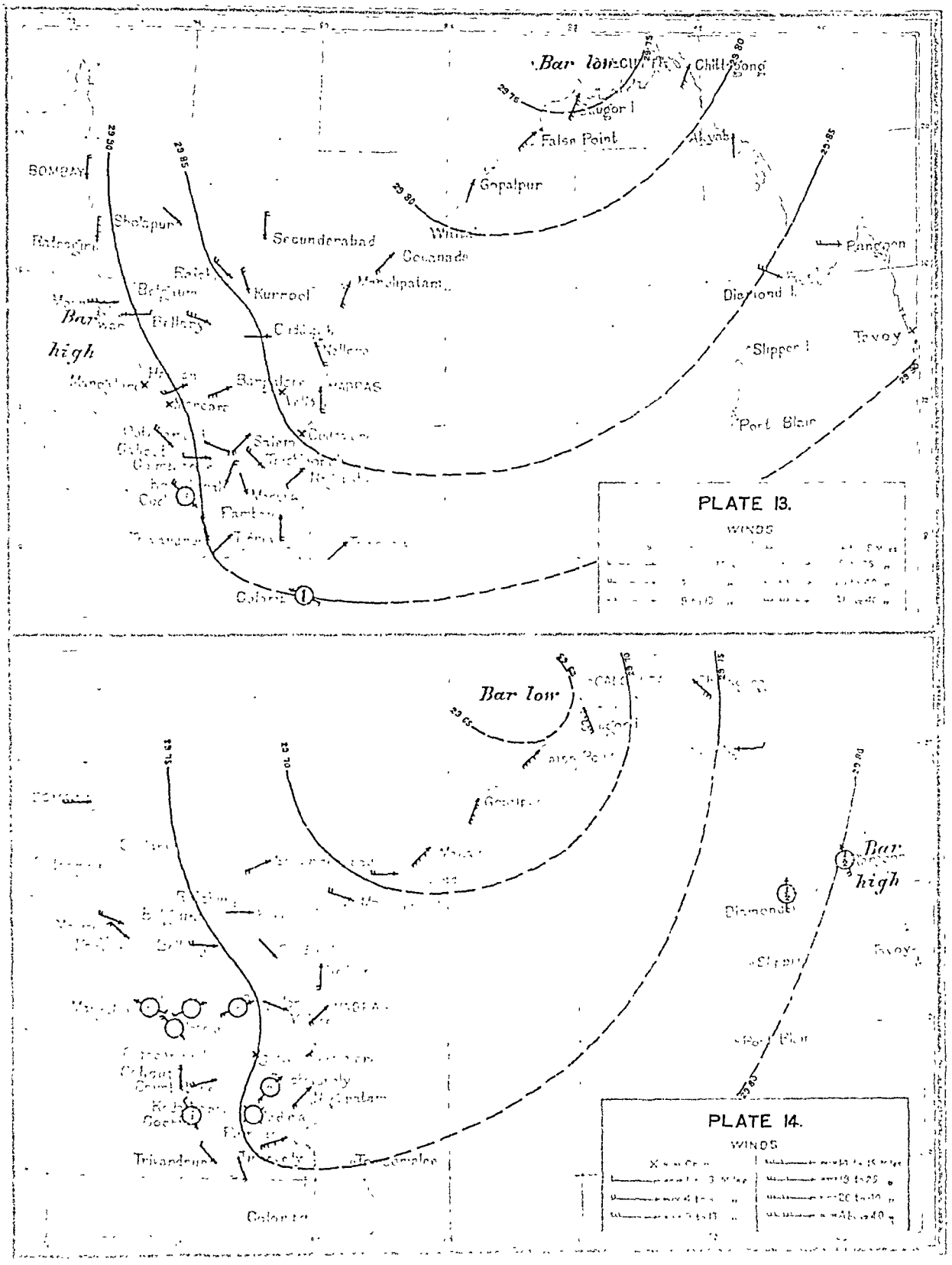
Rainfall is shown by a ○ and the number in the circle shows the amount to the nearest half inch.

Cool nights are occasionally experienced in March and as has been already explained these are closely associated with high pressure in the Deccan and a reversal of the normal pressure distribution.

Plate 13 (31st March 1903) is almost identical in general character with the May or advanced hot weather distribution. On this occasion day temperatures were 3° to 5° above the average in the Ceded Districts and Circars. Another example (16th April 1904) may be referred to.

MAY.

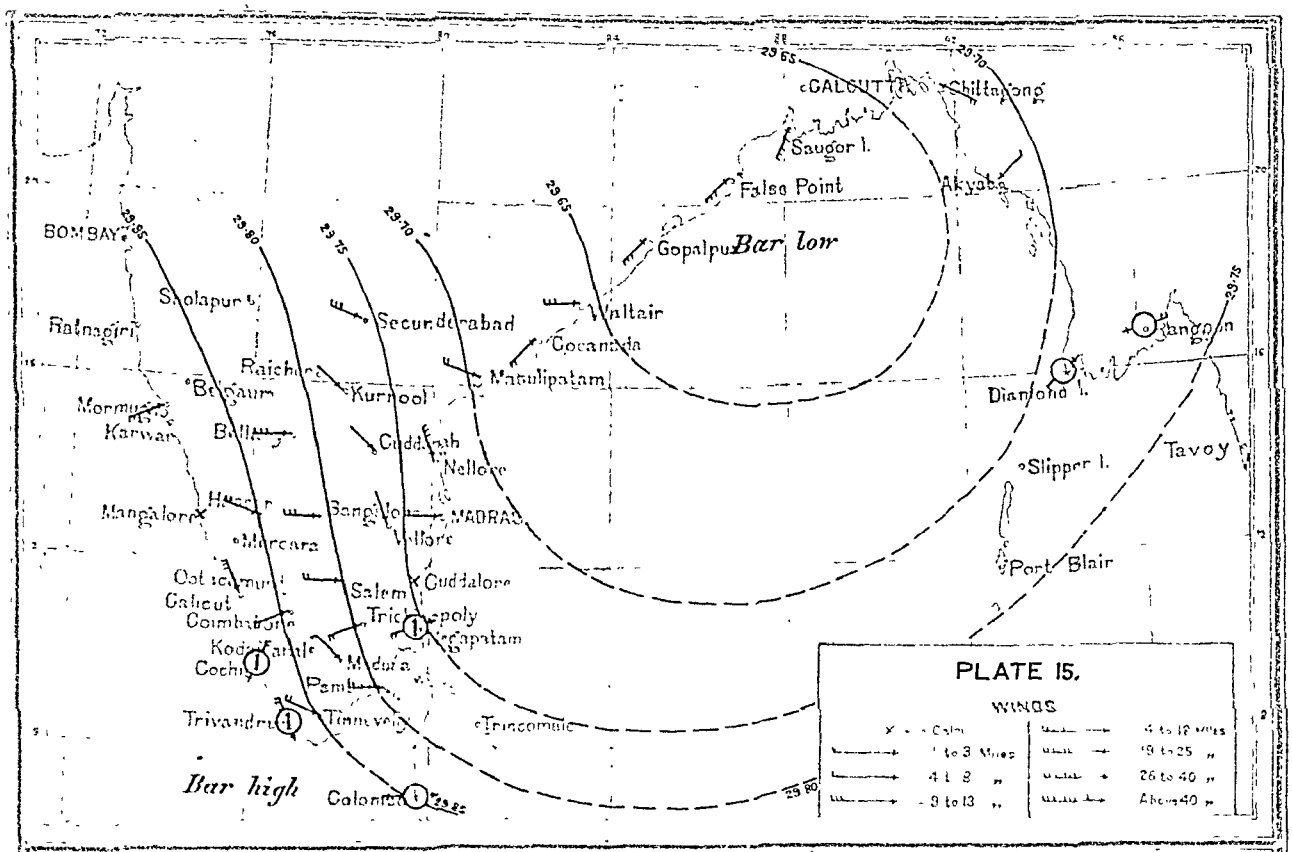
The pressure distribution undergoes very large and rapid alterations as the hot weather advances. In the normal distribution pressure is highest along the west coast and lowest at the head of the Bay. The isobars run nearly parallel to the line of the west coast over the land area and then turn eastwards across the Bay. The pressure differences are larger than in the preceding months of the hot weather. The highest temperatures generally prevail in the tract extending from Nellore northwards and north-westwards towards the Deccan. Winds are north-westerly in direction and are intensely dry. At Madras the average direction is south-westerly, but it undergoes larger variations in direction and strength during the day in this month than in any other month of the year. The average daily velocity also is higher than at any other period of the year. Plate 14 (3rd May 1900) shows a nearly normal distribution for May. In this case the maximum temperatures in the Ceded Districts were 105° F. to 107° F.

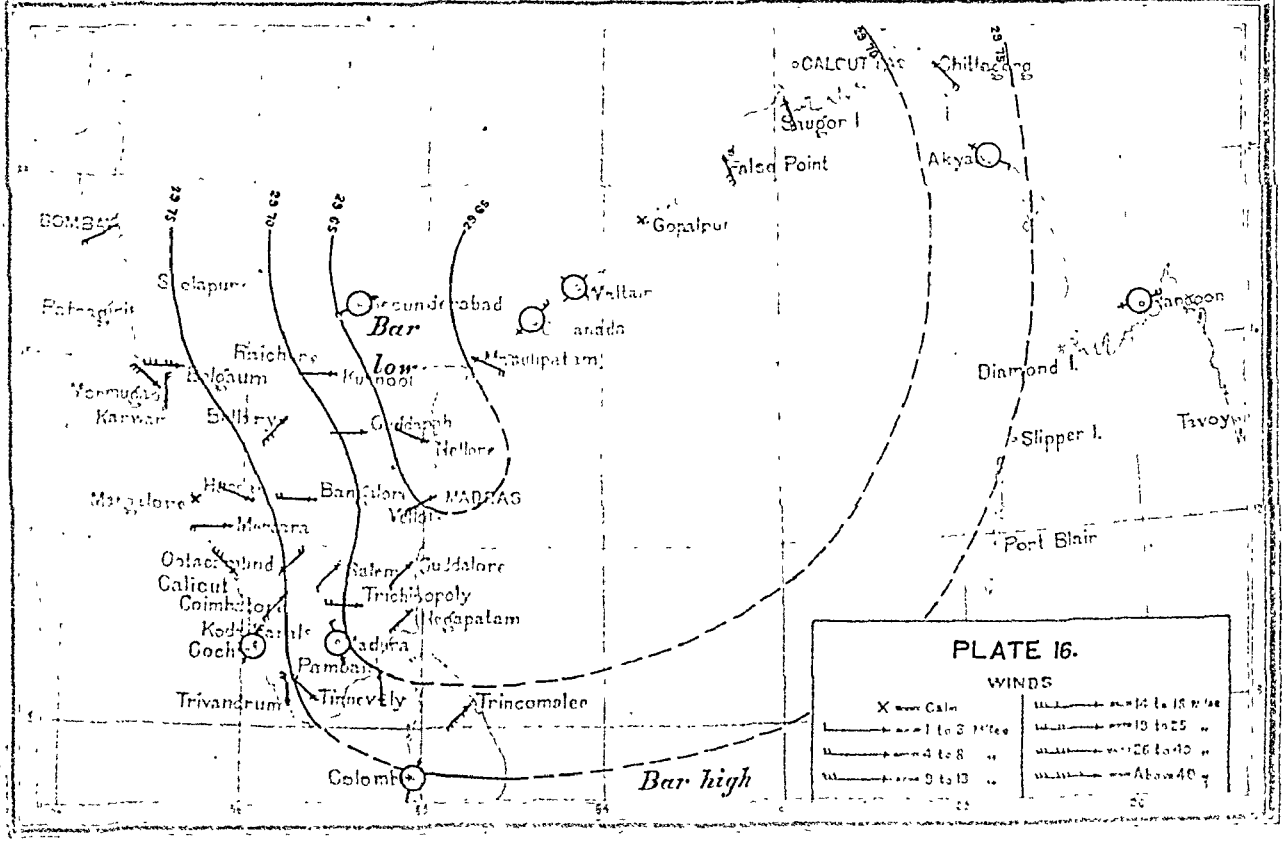


Rainfall is shown by a ○ and the number in the circle shows the amount to the nearest half inch.

Occasionally gradients over the Peninsula become much steeper owing to fall in pressure and formation of a depression in the Bay. Under these circumstances westerly winds prevail on the Madras coast throughout the day and the sea breeze which usually sets in about 12 o'clock does not appear at all. The hottest area is along the Madras coast where the temperature effect is cumulative, due to the general westerly air movement over a more or less strongly heated surface. The highest temperatures in the whole of India are sometimes recorded at Masulipatam under these conditions. Probably part of this high temperature effect on the east coast is also due to the descent of the air from the higher level of Mysore and the Deccan to sea level and its compression which would of itself cause a rise in temperature. Plate 15 (8th May 1901) shows a distribution of this type. At Bellary, Kurnool and Secunderabad maximum temperatures were slightly below the average; but at Masulipatam it was 11° F. above the average and at Madras 10° F. Another example of the same kind of distribution is shown in the chart for 6th June 1901. A reference to this shows that the monsoon had just reached the west coast and the formation of the depression in the Bay was probably due to the advance of the monsoon into this area. On this occasion the maximum temperature at Cocanada was 111° F. and at Masulipatam 110° F. (See also 28th May 1906.)

Plate 16 (18th May 1899) shows a type of distribution which sometimes precedes hot weather storms. The narrow area of lowest pressure from Madras northwards extended in this instance into northern India. Dry north-westerly winds were blowing into this area over the Ceded Districts and moist sea winds from the south-east at Masulipatam and the Bay, the temperature throughout the low pressure area being over 100° F. Storms of the hot weather type accompanied by increased pressure occurred over this area during the next 24 hours, Madras receiving 0·88 inch of rain.





Rainfall is shown by a ○ and the number in the circle shows the amount to the nearest half inch.

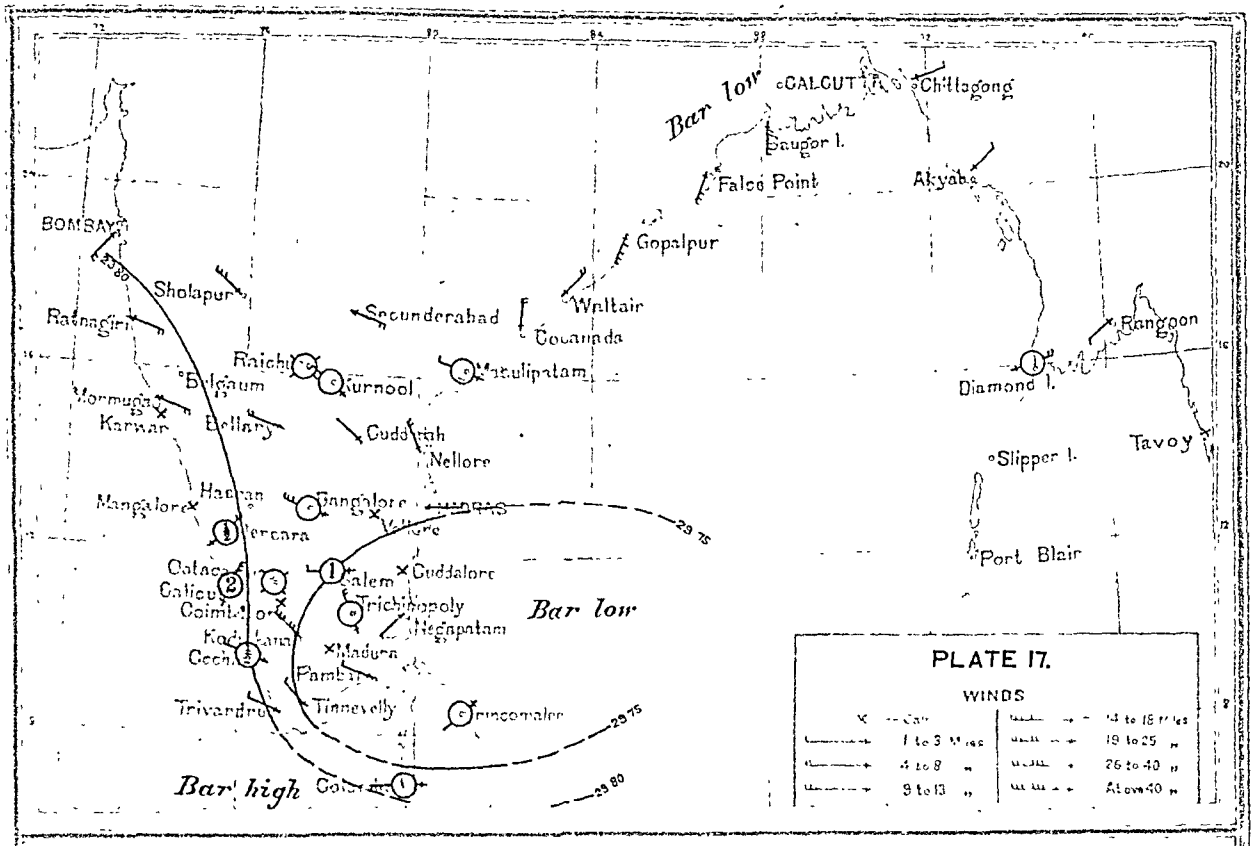
Depressions sometimes form in the centre or south of the Bay during this month. If they form during the first half of the month they will probably move in a westerly direction towards the Madras coast, and for a time will establish weather conditions over the south of the Bay and the Presidency similar to those typical of the north-east monsoon. Plate 17 (10th May 1903) shows such a distribution with pressure low in the south-west of the Bay. This depression was a diffused one but it brought easterly and northerly winds over the south of the Presidency and general rain. The south-west monsoon was blowing into the Bay as shown by the indications at Colombo, and changing round through south and east, was striking the Madras coast.

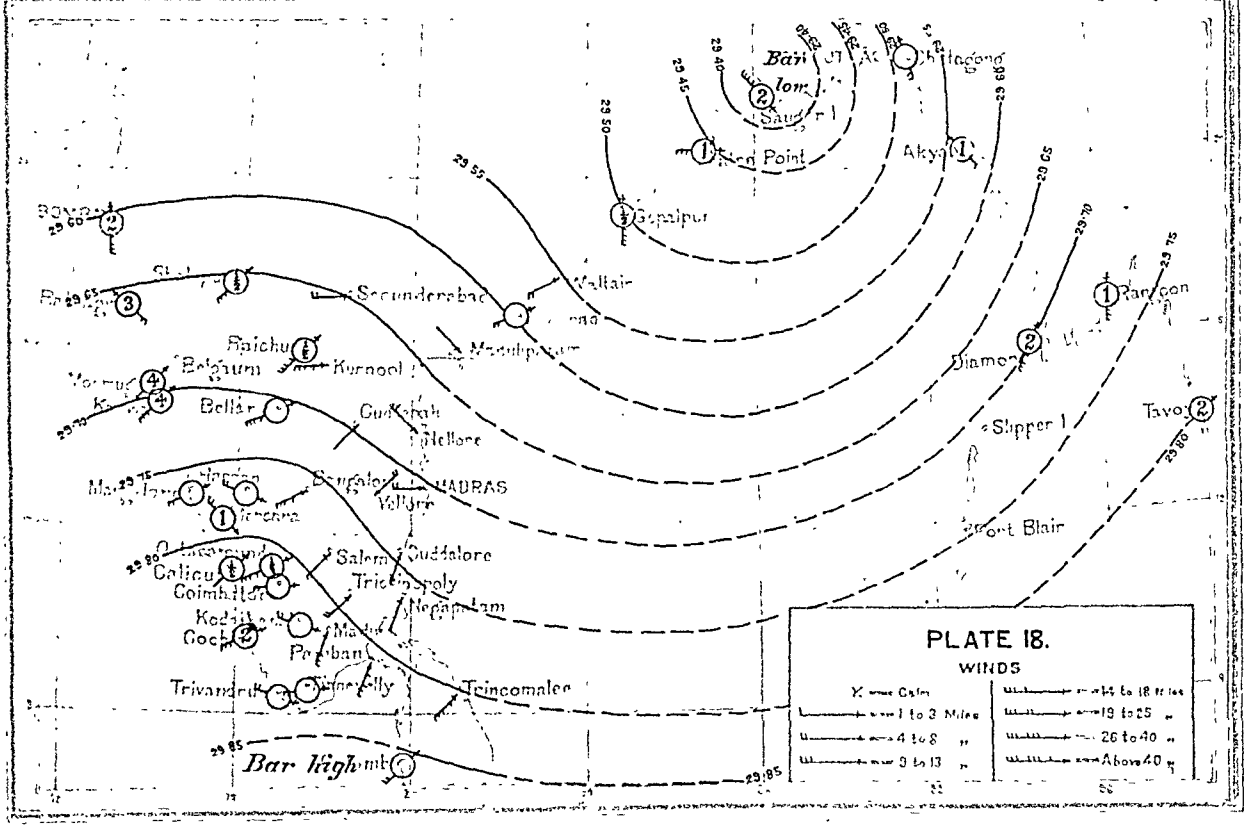
JUNE.

The first week in June is the normal time for the south-west monsoon to burst on the west coast. This is accompanied by a complete change in the character of the pressure distribution. Steep gradients are established on the west coast where previously pressure had been uniform from Colombo to Bombay. South-westerly winds now prevail over the Presidency, and when the monsoon is strong the sea breeze either does not set on the Madras coast at all during the day or lasts for a very short time. Temperature falls rapidly over the western half of the Presidency and rain is frequent and sometimes very heavy. Over the eastern half the temperature fall is slower and is slowest on the Madras coast; only occasional showers and rain squalls occur here. In the Bay the south-west monsoon is established during the second week in June. Plate 3 shows the normal south-west monsoon distribution.

JULY, AUGUST, AND SEPTEMBER.

During these months the south-west monsoon is blowing across the Peninsula and the normal pressure distribution resembles that for June. As the season advances gradients become less steep and the south-westerly winds become weaker. At the commencement of the monsoon there is very little change in weather conditions on the Madras coast. Occasionally indeed higher temperatures are experienced here than just before the monsoon has set in. This is especially the case when the monsoon is strong at the beginning. Plate 18 (10th June 1904) shows a strong monsoon on the west coast, and heavy rain and a vigorous south-westerly movement across the Peninsula, with high temperature at Madras.



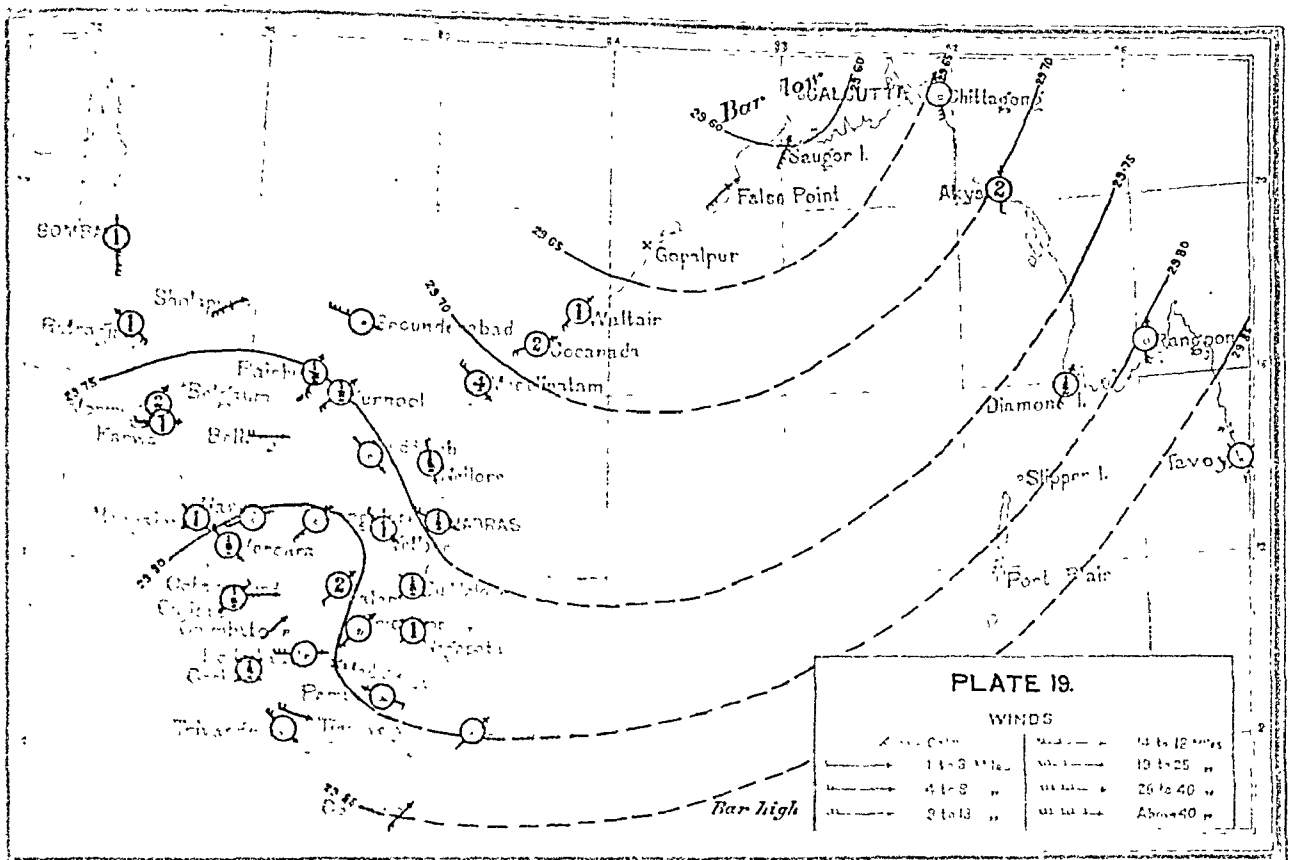


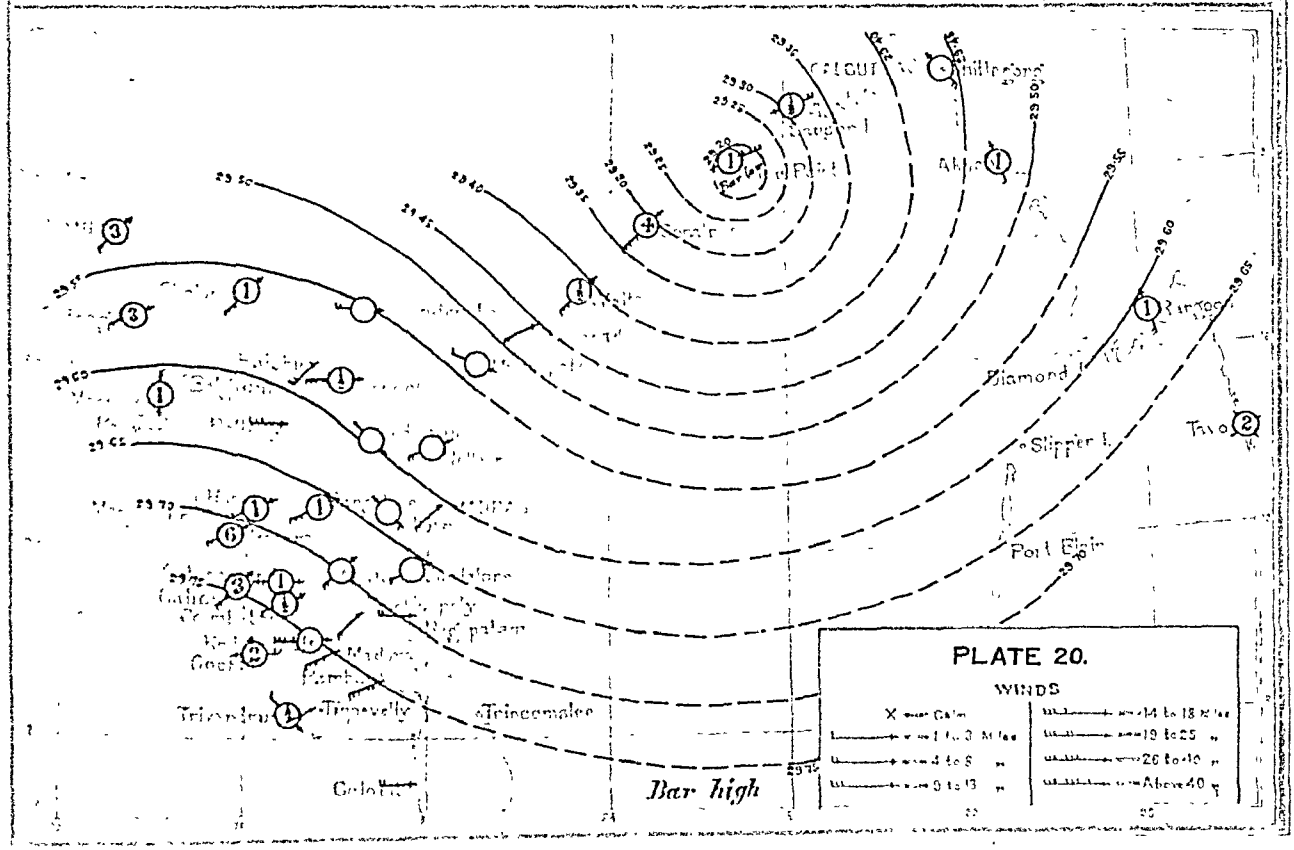
Rainfall is shown by a ○ and the number in the circle shows the amount to the nearest half inch.

With the advance of the season temperature falls steadily, humidity rises and showers increase in the Carnatic and on the Madras coast. Wind direction changes very little but there are great variations in strength. As a general rule with a strong monsoon very little rain falls in the Carnatic. It is during breaks in the monsoon, that is periods when the monsoon is weak, that showers are received here. As the air movement falls off in strength during these months showers become more frequent and the rainfall heavier. Thus at Madras the average rainfall in June, July, August and September, is 2·11, 3·87, 4·56 and 4·69 inches, and at Trichinopoly the average rainfall is in these months 1·39, 1·83, 4·35 and 5·01 inches respectively. This rule does not apply to stations on the west coast which receive the full benefit of the monsoon. Thus at Calicut the rainfall is during these months 36·46, 29 36, 14·89 and 7·39 inches respectively. For these the rainfall diminishes as the monsoon becomes weaker.

Plate 19 (17th June 1903) shows a weak monsoon with general rain over the eastern half of the Presidency.

Plate 20 (21st July 1906) shows the pressure distribution accompanying a very strong monsoon in July. It will be noticed that contrary to the general rule given above a number of stations in the Carnatic showed rainfall. The amounts were however less than 0·1 inch in all cases except at Vellore where it was 0·30 inch. These showers must be ascribed to the antecedent conditions, the monsoon having been weak and rain general over the south a few days previously.



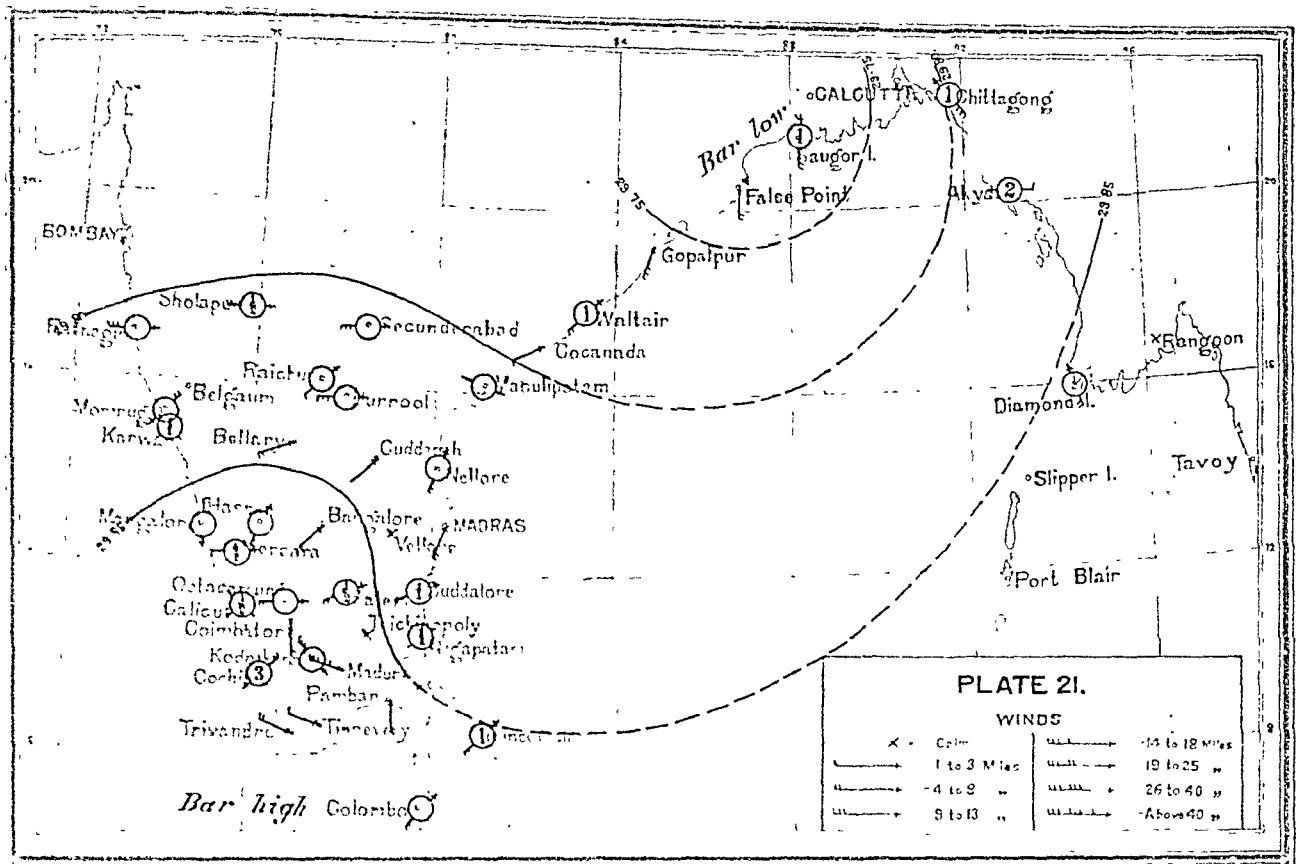


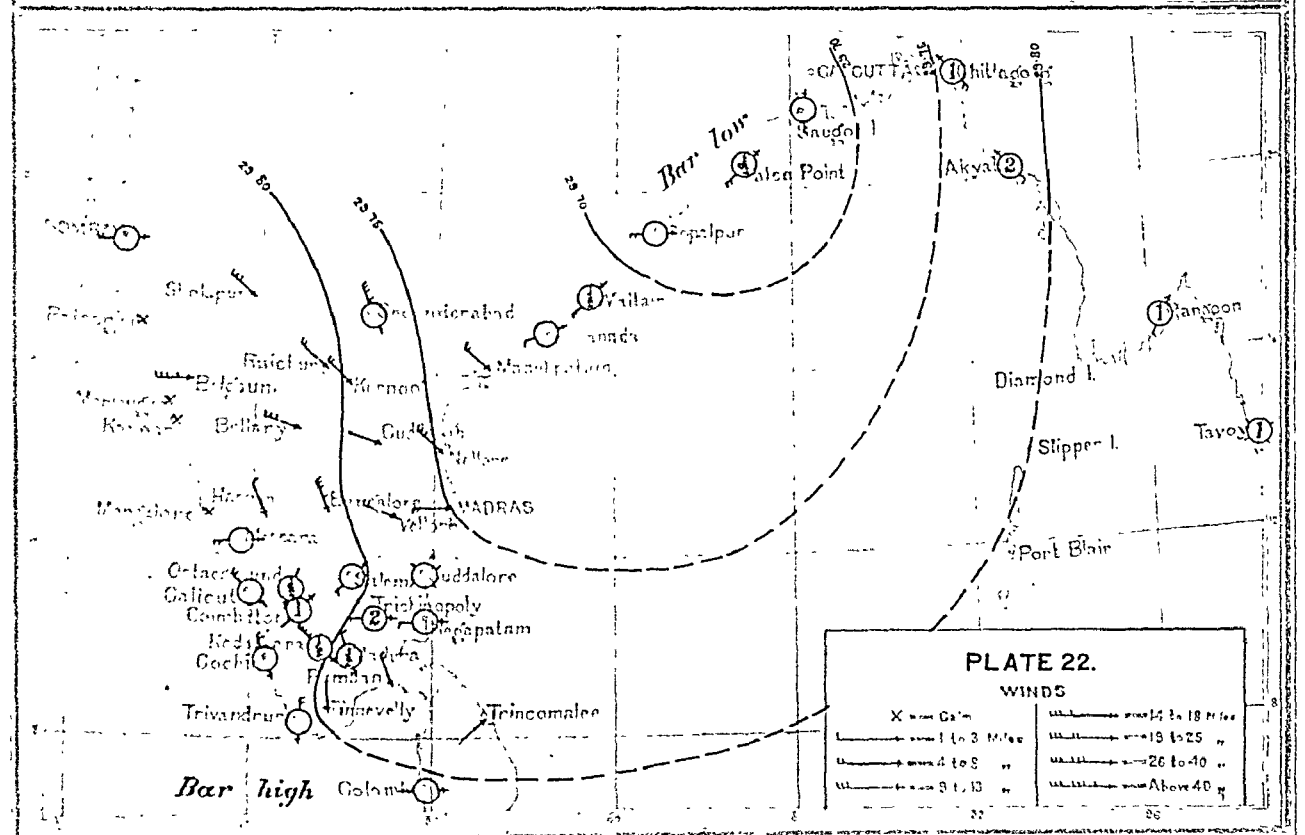
Rainfall is shown by a ○ and the number in the circle shows the amount to the nearest half inch.

Plate 21 (31st July 1906) shows a weak monsoon in July with heavy rain at Negapatam and Cuddalore.

Plate 22 (6th September 1903). There was no monsoon on the west coast and the pressure distribution resembled the May hot weather type. High temperatures prevailed in the north of the Presidency, the maximum at Nellore being over 100° F. To the south of Salem showers were general and heavy in places.

Towards the end of September the south-west monsoon ceases on the west coast; pressure becomes uniform and winds during this period are very light. There is no well-defined large-scale air movement, the winds prevailing being local and determined chiefly by temperature differences. More calm hours are recorded during this month than in any other month of the year. Humidity is high and this, combined with the frequent absence of any breeze, makes it the most trying period during the year at Madras.





Rainfall is shown by a ○ and the number in the circle shows the amount to the nearest half inch.

Plate 23 (18th August 1903). Sometimes very heavy and sudden showers of two or three inches are received during the south-west monsoon months in the area under consideration. Plate 23 shows the meteorological conditions which appear to be characteristic of this. These showers are very local, rain-gauges only a mile apart often showing differences of inches. It will be noticed that winds on the Bombay coast and the Deccan are north-westerly. Owing to conditions outside the area the monsoon on the Bombay coast is directed more towards southern India than northern India. These are conditions which appear to favour these sudden bursts.

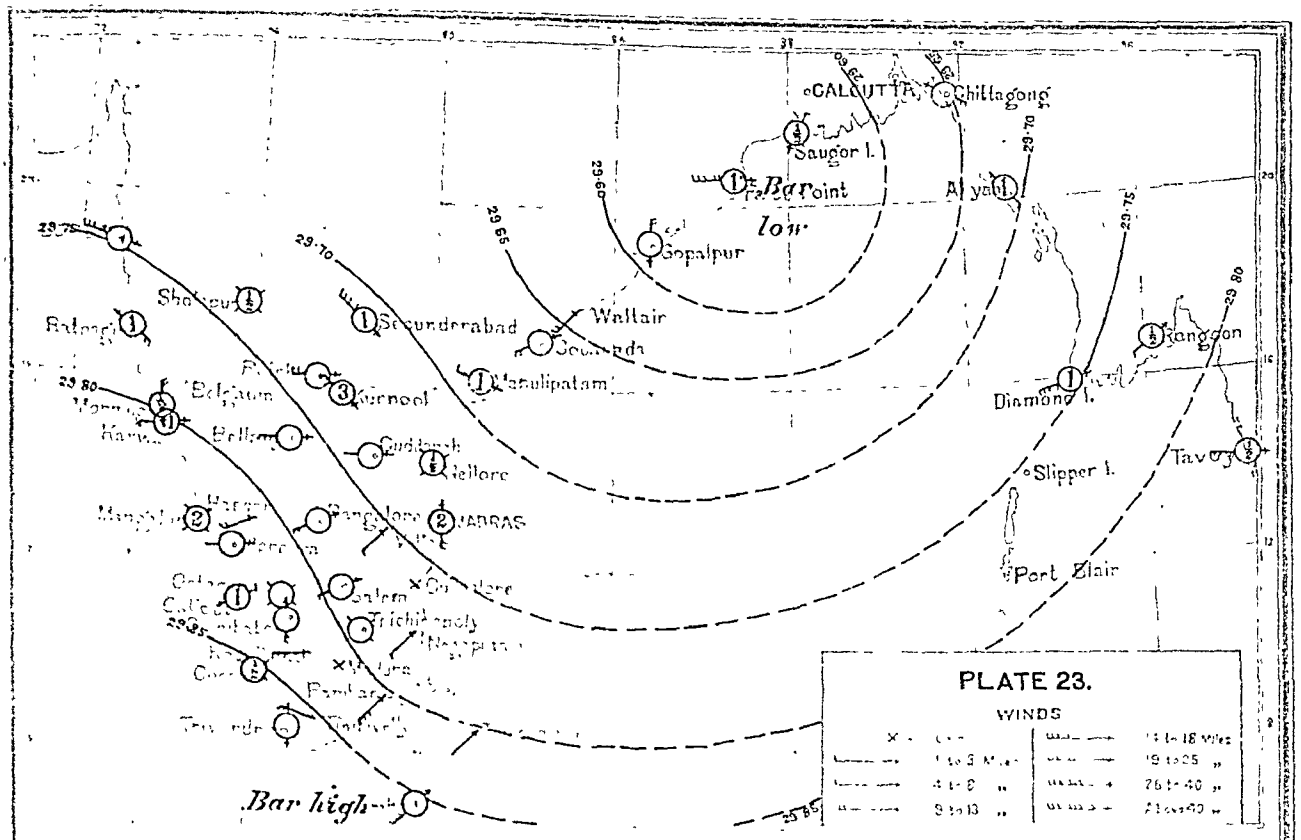
OCTOBER, NOVEMBER AND DECEMBER.

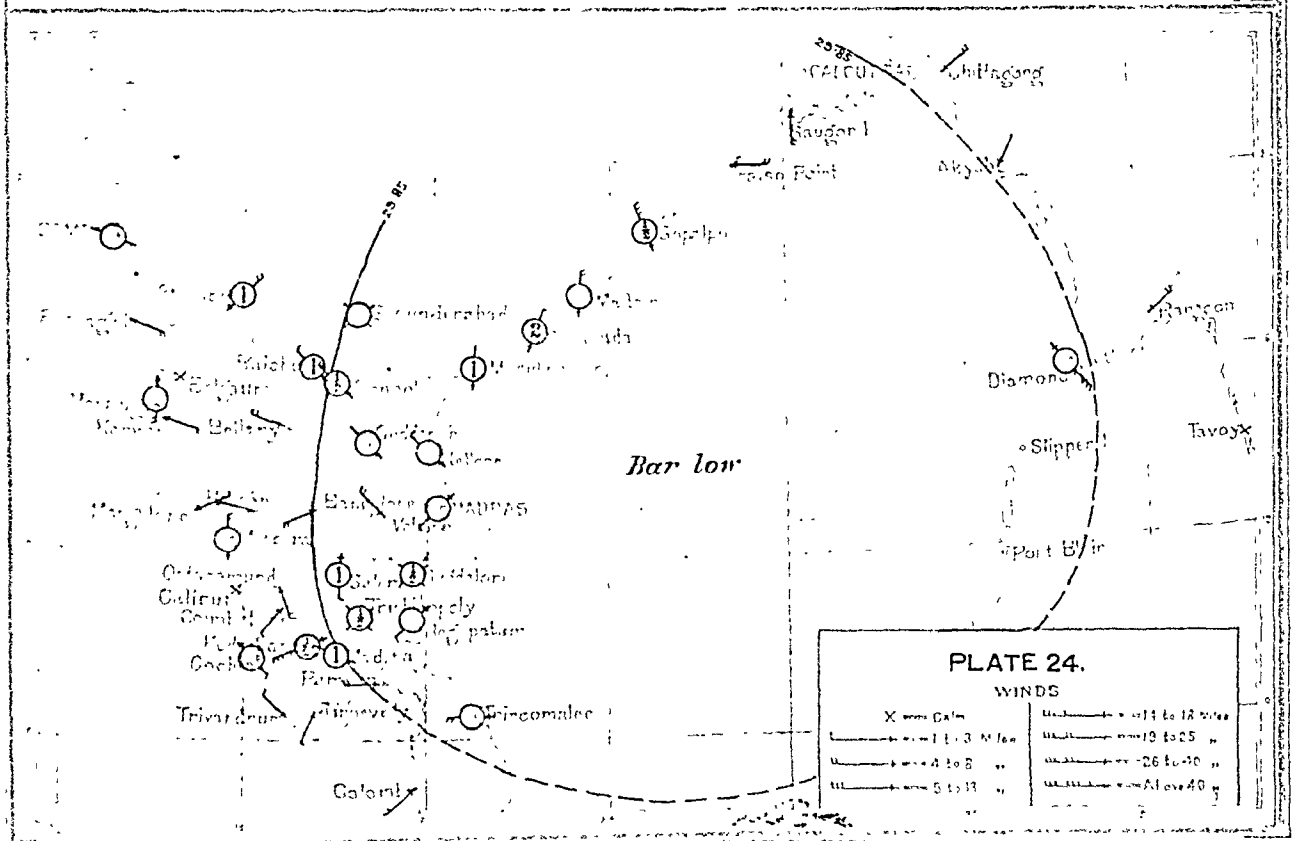
The most important change in the weather in the Presidency during the whole year is the burst of the "north-east monsoon." What the north-east monsoon really is and the pressure conditions that determine its establishment have already been briefly explained on page 55. The meteorological changes that lead up to these are very shortly as follows.

During the last week in September and the first two weeks in October, the south-west monsoon currents withdraw from upper India and Bengal and fine weather sets in over these areas. These changes are accompanied by increase in pressure over these areas and the distribution becomes very uniform over the Bay in consequence. Calm weather prevails at this time over this area while the south-west monsoon is still blowing in the south of the Bay.

These conditions over the Bay favour the formation of cyclonic storms and cyclones, and the position and course of these storms determine the distribution of the north-east monsoon rainfall. The high pressure in northern India extends gradually southwards, and the manner in which this extension takes place exercises a very powerful effect on the position and course of the storms, and hence on the distribution of north-east monsoon rainfall from October to December.

Plate 24 (13th October 1904) shows an approximately normal pressure distribution over the land area. Over the centre of the Bay pressure is low and winds are cyclonic in direction at the surrounding coast stations. A strong south-easterly wind is blowing at Diamond Island and this generally indicates that a storm is forming. Showers are falling in the Presidency but in the south they resemble the September showers, not the north-east monsoon rain. In this case the centre of the depression appears to be too far to the east to bring the north-east monsoon winds on to the Madras coast, though it appears that they have reached the Circars.

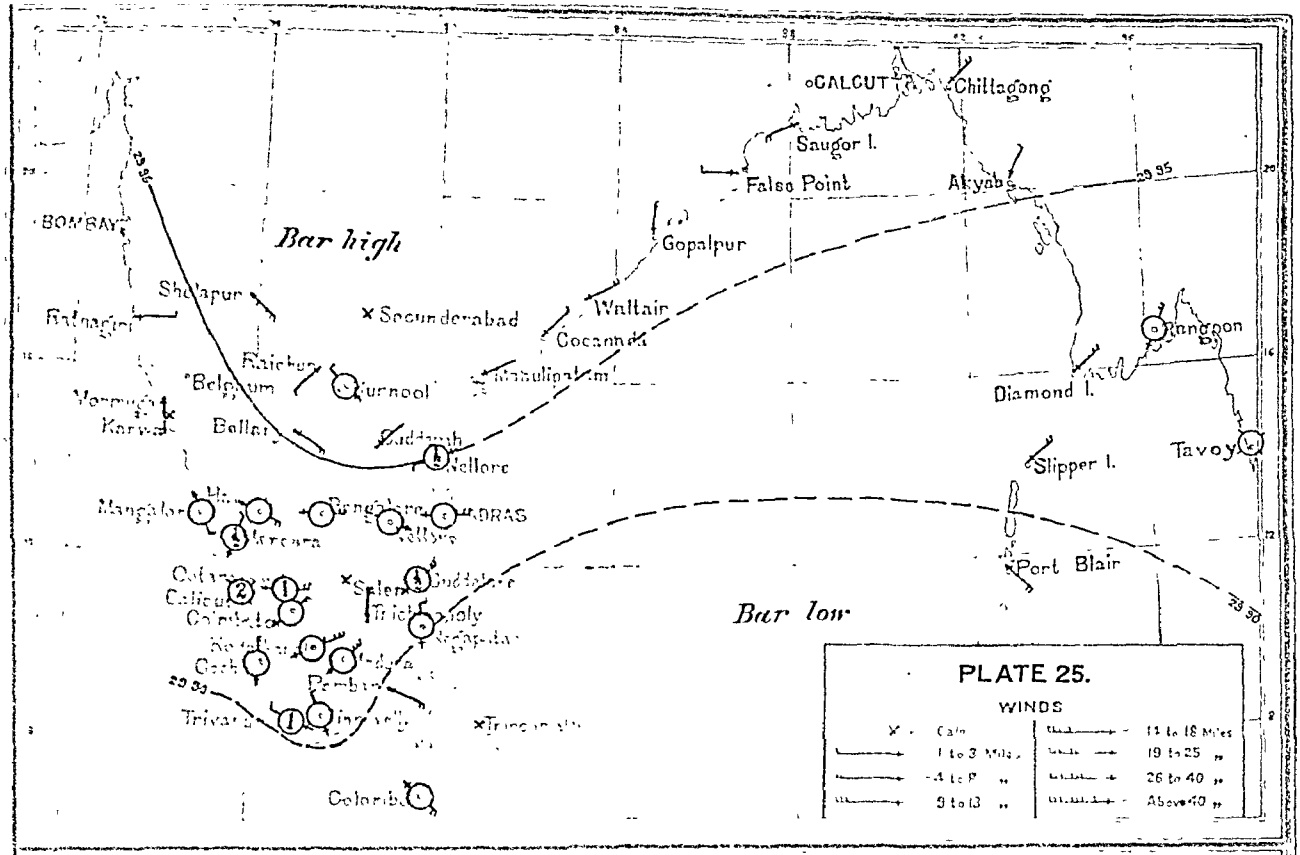


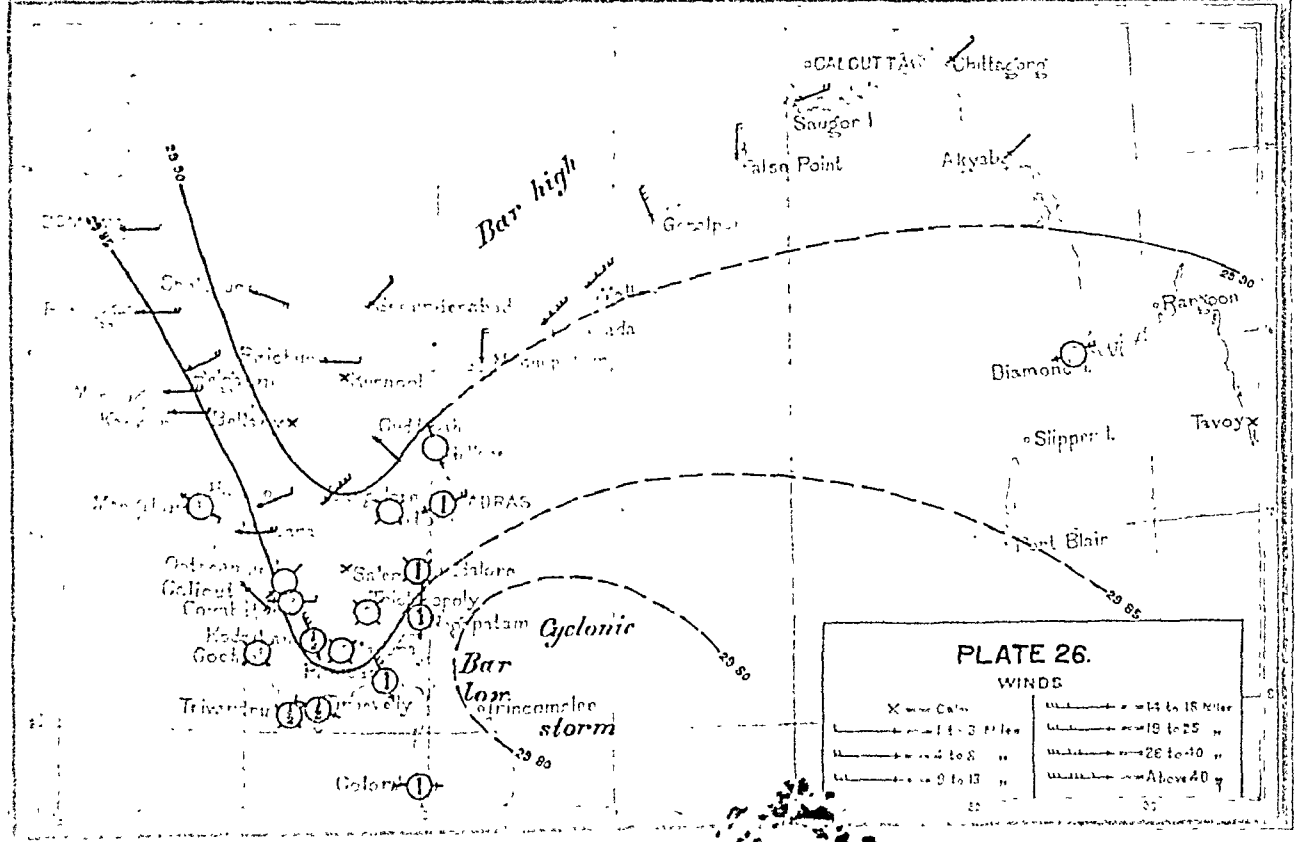


Rainfall is shown by a ○ and the number in the circle shows the amount to the nearest half inch.

Plate 25 (5th October 1905) shows the kind of pressure distribution that usually obtains when the north-east monsoon bursts. The low pressure area in the Bay lies between Port Blair and Ceylon, and nearer the latter than the former. The position thus determines the monsoon winds towards the Madras coast, and rain with northerly and north-easterly winds is now general over the south. The gradual deflection of the winds is shown by the south-easterly winds at Port Blair, easterly winds at Madras and northerly winds at Negapatam.

The position of this seasonal low pressure area which persists in the Bay during the north-east monsoon period can be inferred with fair certainty by a comparison of the pressure abnormals over Burma and the Madras coast. If the extension southwards of the high pressure from the north (already referred to) takes place more rapidly over Burma than over the Peninsula, the pressure abnormal will be greater on the Burma coast than on the Madras coast and the seasonal low pressure area is forced westwards towards Negapatam. Another illustration of this is shown in Plate 26. If, on the other hand, the extension takes place more rapidly over the Peninsula, the depression is forced eastwards and the pressure abnormal is greater on the Madras than on the Burma coast. Under these conditions the Madras coast is too far away to be influenced by the disturbed and rainy weather associated with the depression.





Rainfall is shown by a ○ and the number in the circle shows the amount to the nearest half inch.

Plate 27 (30th October 1904) illustrates this distribution. Northerly winds are blowing on the Madras coast and become north-easterly during the day; but general directions are more northerly than usual. Pressure is highest in the Deccan, and the air movement is chiefly of land origin. With these conditions skies are very clear and during the night radiation is very active, minimum temperatures are lower than usual, and as a rule heavy dew falls during the early morning hours and even for some time after sunrise. Thus these facts account for the saying well known in Madras that heavy dew in the October-December period is an indication of deficient monsoon or "is bad for the monsoon".

Plate 28 (10th November 1901) shows an approximately normal November distribution.

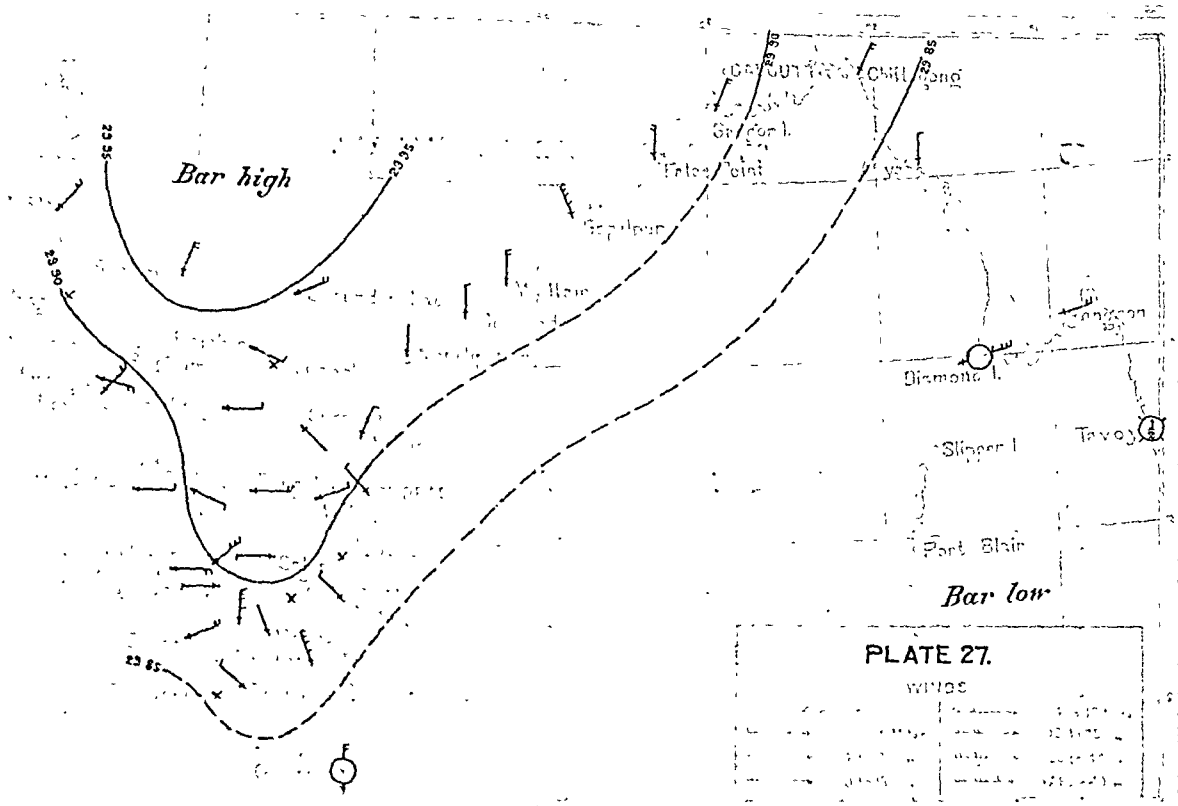


PLATE 27.

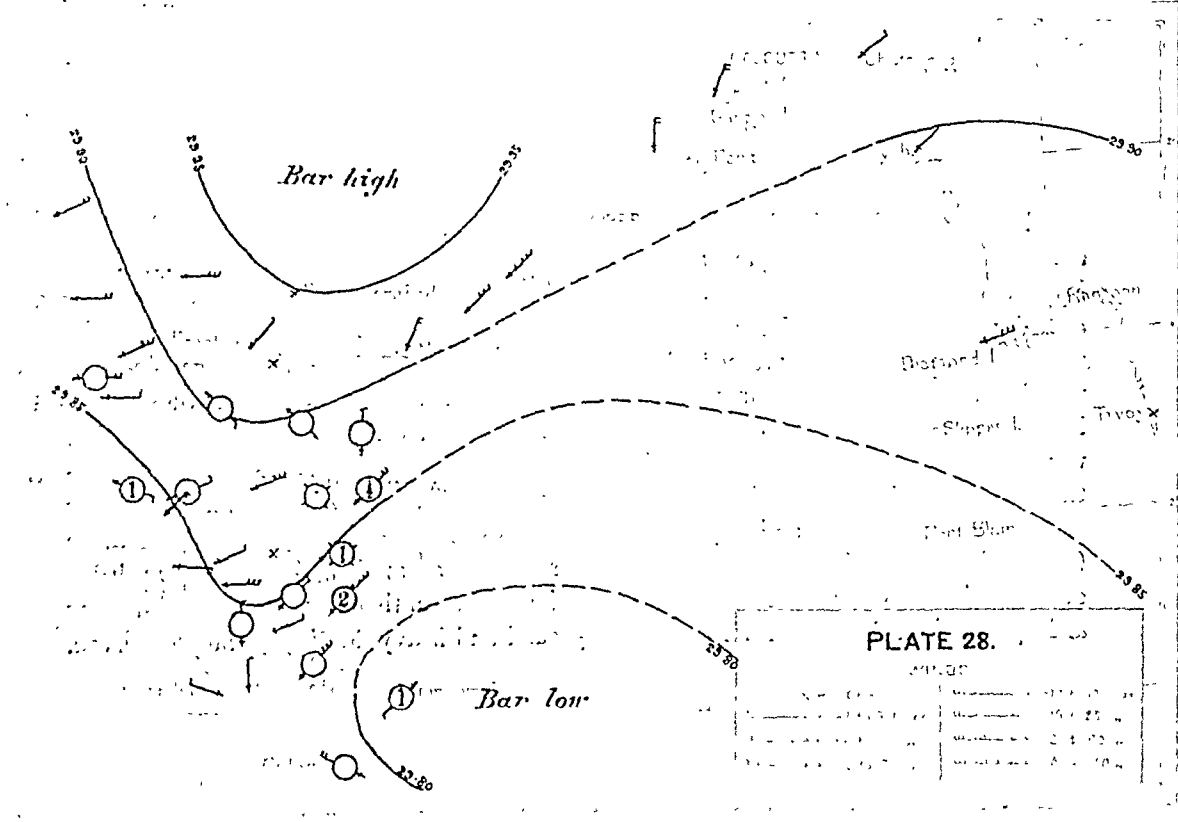
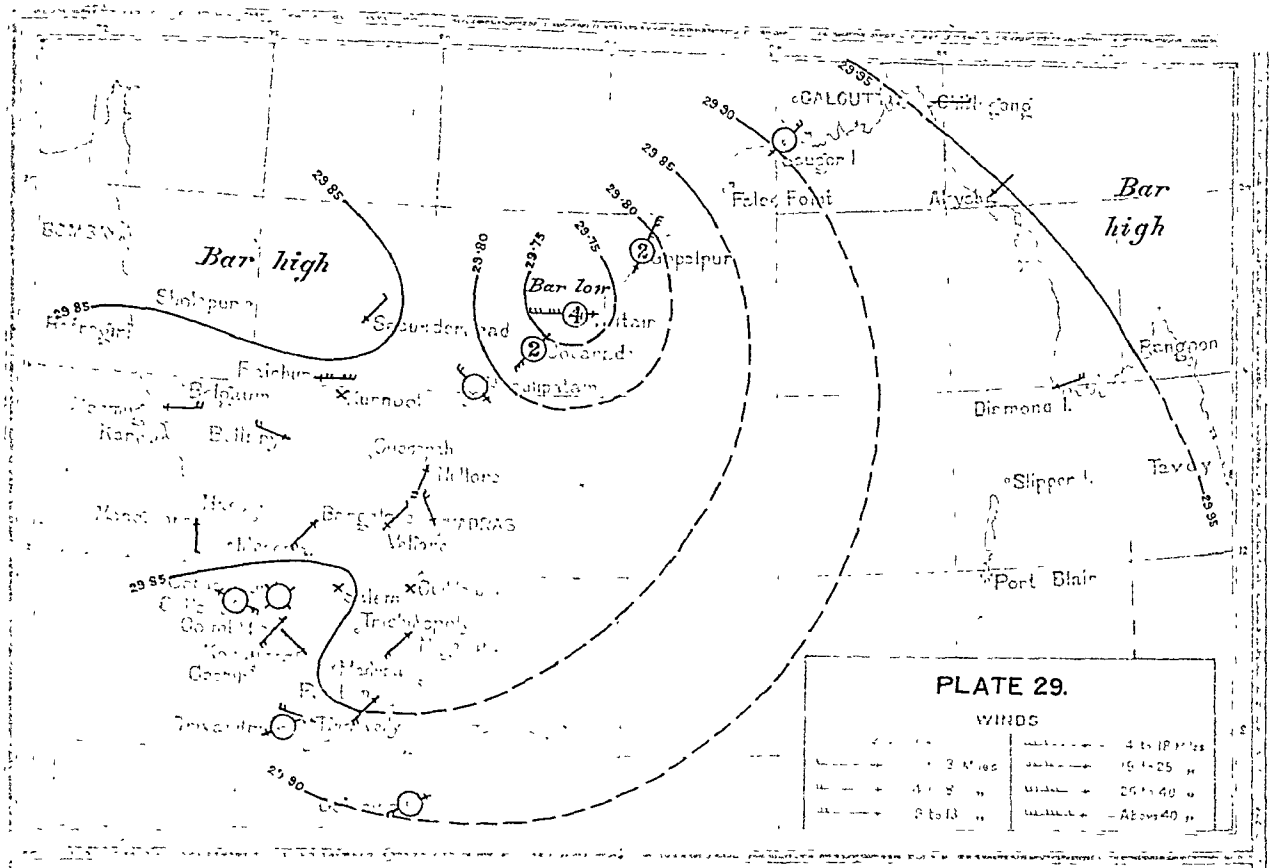


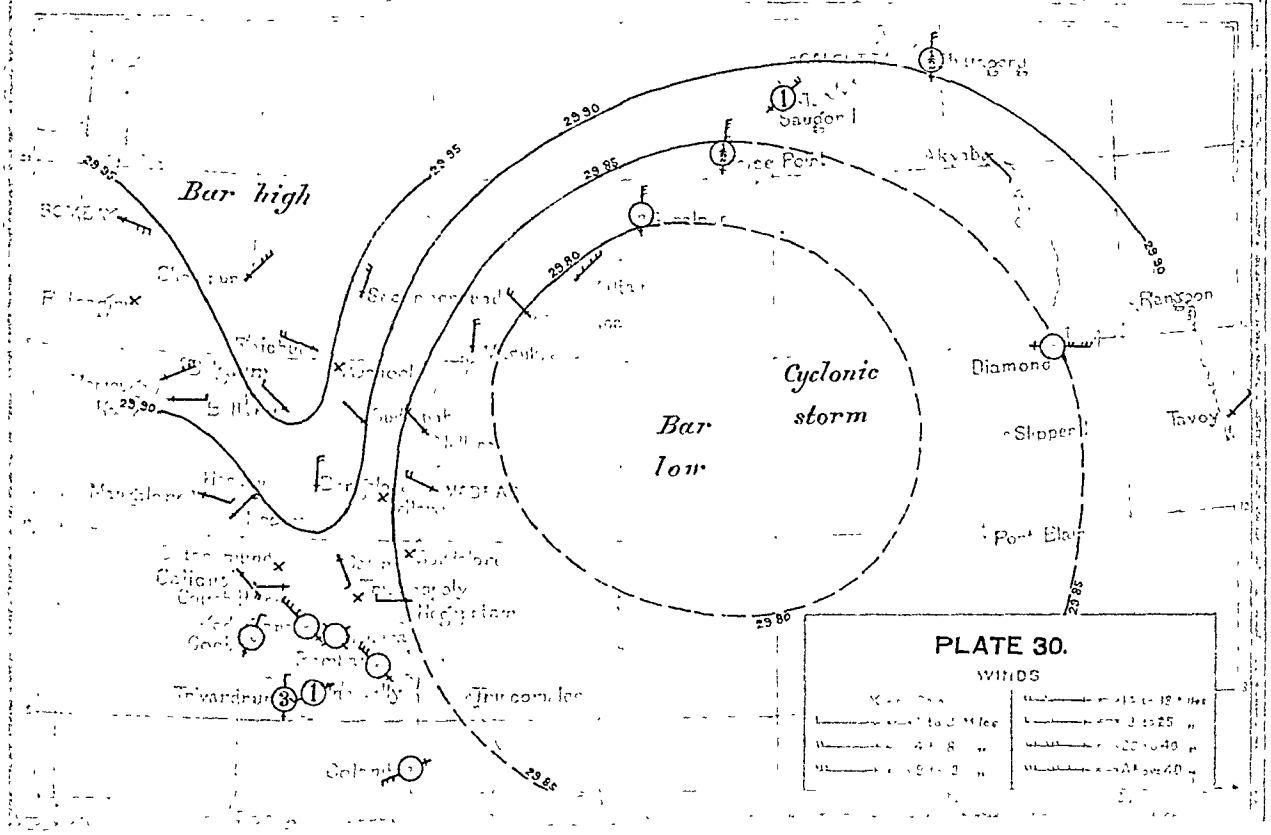
PLATE 28.

The number on the rocks shows the amount to the nearest half inch.

These remarks show that the rain received during the north-east monsoon is closely associated with the seasonal depression in the Bay. This depression is generally stationary, but sometimes it develops into a cyclone or a cyclonic storm which moves westwards or northwards and carries the rain with it. The course of the storm exercises a very large influence on the weather in Madras. Plate 29 (14th November 1901) shows the position of a storm which formed in the south-west of the Bay, moved towards the Circars coast in a northerly direction and gave heavy rain here and thence along the coast to the head of the Bay. Pressure was low in the Deccan and Bombay also, and night temperatures were high over the Presidency. In fact the distribution over the south of the Presidency and Ceylon was of a feeble south-west monsoon type and the usual south-west monsoon temperature conditions in this area accompanied it.

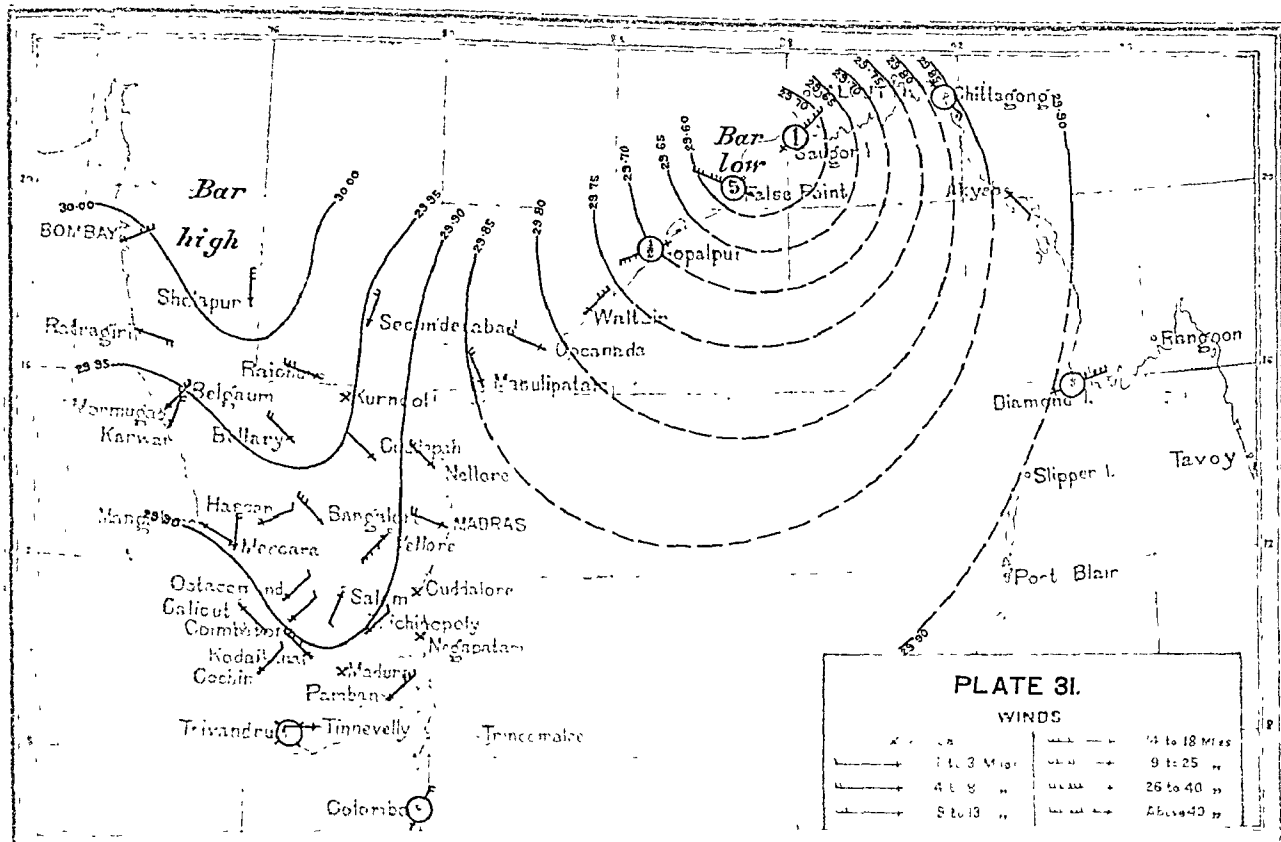
Plates 30 and 31 (25th and 26th November 1901) show for two consecutive days the distribution accompanying a storm which also formed in the south-west of the Bay and moved northwards towards the Circars coast and then moved in a north-easterly direction towards the head of the Bay. It will be noticed that in this distribution, unlike that shown in Plate 29, pressure is high in the Deccan. Under these circumstances very low minimum temperatures are experienced over the south of the Presidency. Minimum temperatures as low as or below 60° F. are not often reached in Madras, but when they do occur they almost invariably accompany pressure distributions and conditions similar to those shown in these two plates. Winds are very light and the air is very dry in the Carnatic, and very large differences exist between the ground temperature (grass minimum) and the minimum temperature of the air at four feet. A very large difference is also observed under these conditions between the temperature downstairs and upstairs in a house. Mist lies on the ground and heavy dew is generally observed.

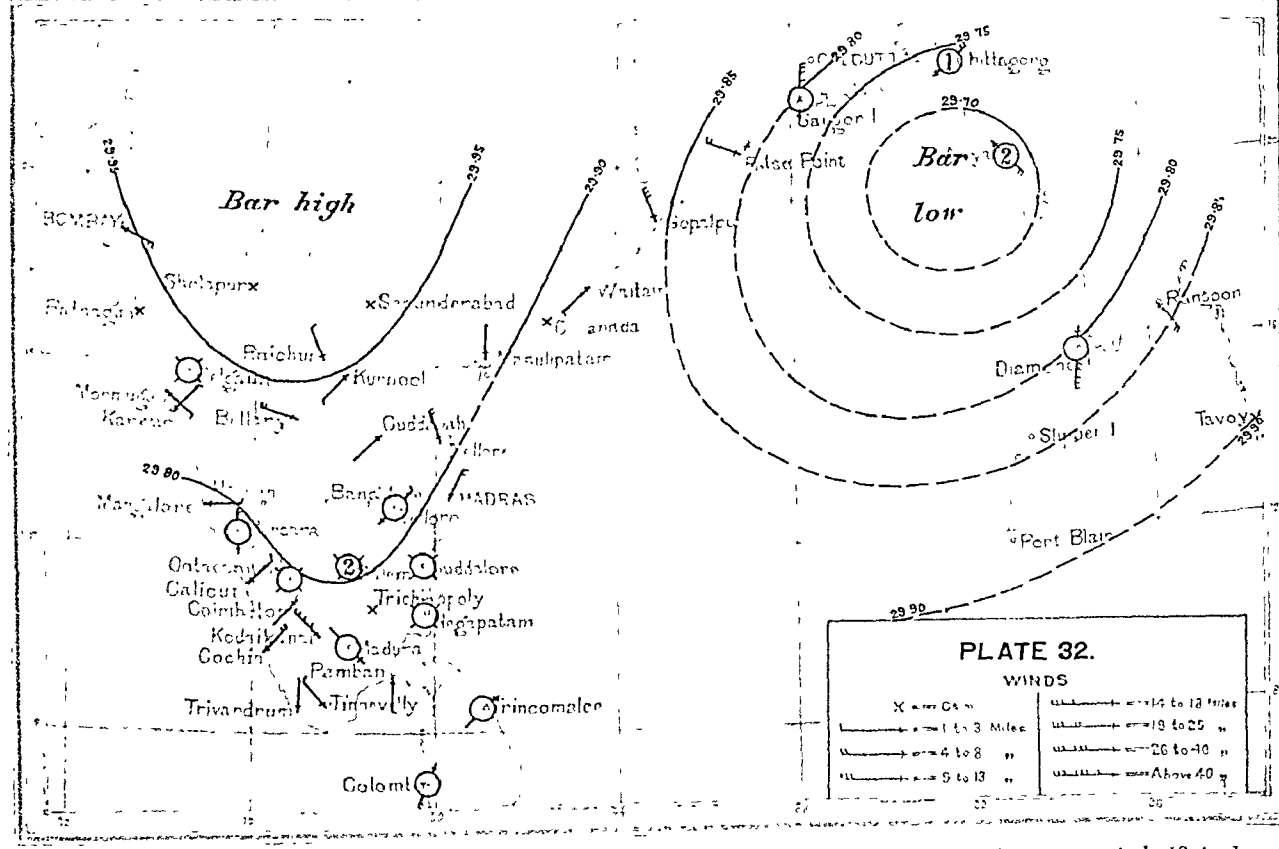




Rainfall is shown by a ○ and the number in the circle shows the amount to the nearest half inch.

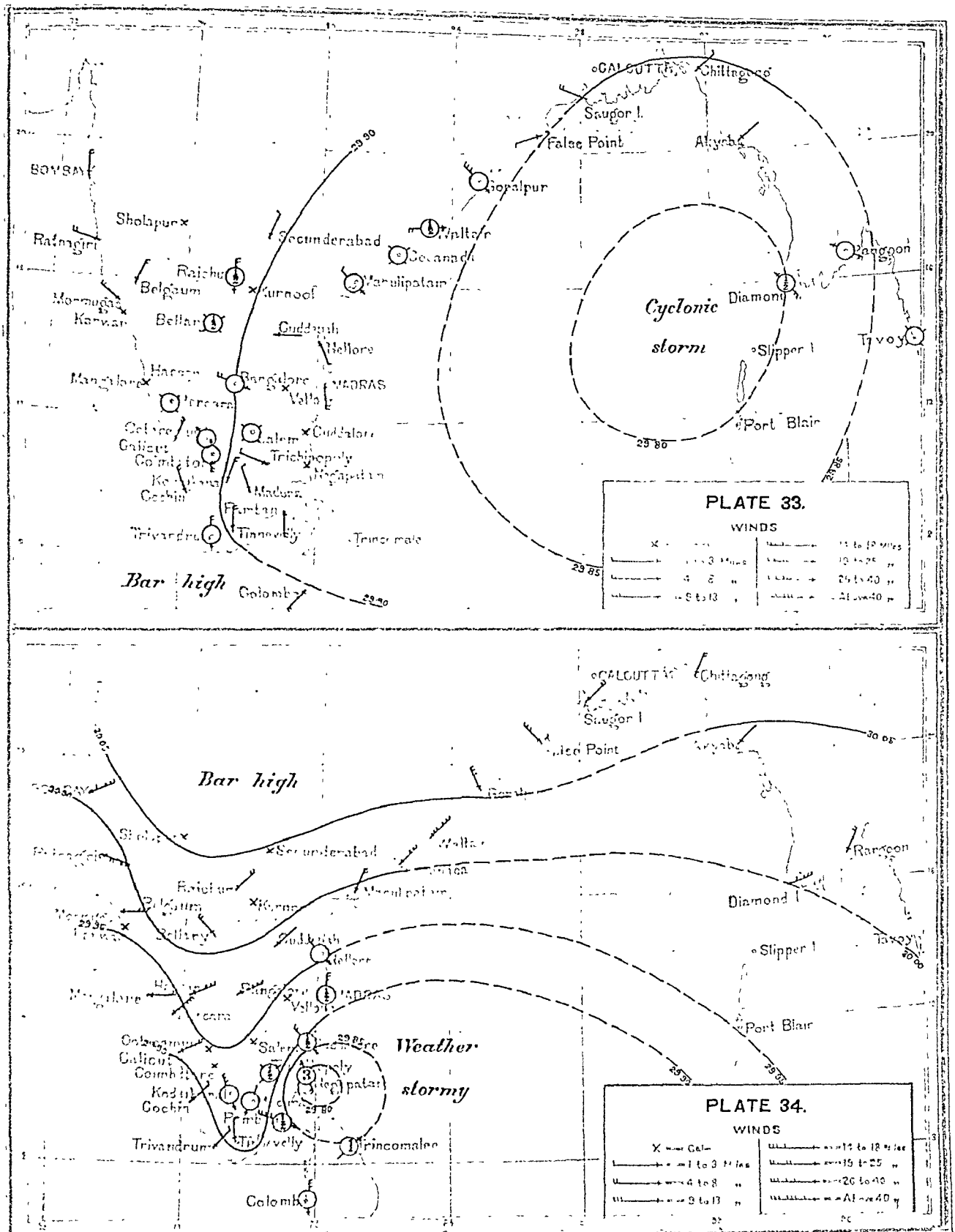
Plate 32 (15th November 1903) shows the distribution on the third day after formation of a storm which developed in the south of the Bay on the 12th or 13th of the month. This storm moved in a northerly to north-easterly direction towards the Arakan coast. The rainfall became heavy here in consequence, while in the south of the Presidency it became very light or ceased altogether. As usual with high pressure in the Deccan lower night temperatures than usual prevailed over a portion of the Presidency.





Rainfall is shown by a ○ and the number in the circle shows the amount to the nearest half inch.

Plate 33 (22nd October 1901) shows a similar storm off the Burma coast, but with no high pressure in the Deccan. Day and night temperatures were very high during this period over the Presidency.



Rainfall is shown by a ○ and the number in the circle shows the amount to the nearest half inch.

Plates 34 and 35 show the distribution on two consecutive days, the 29th and 30th December 1903. A storm formed in the south of the Bay and moved westwards towards the Madras coast in this case. These storms bring heavy rain to the area over which they travel, Madras in this instance reporting on the 30th about 6 inches of rain. It appears that in the storms of the north-east monsoon period forming in the Bay which move westwards the weather is worst, the sea roughest and rainfall heaviest to the north of the centre. This is not the case with storms of the south-west monsoon that form at the head of the Bay. These south-west monsoon storms are long-lived after passing inland, but the Madras north-east monsoon storms fill up very rapidly after passing inland and it is only very rarely that a storm survives and passes across the Peninsula into the Arabian Sea. The best known case of this is the storm of November 1886, which developed again into a fierce cyclone after passing across the Peninsula and into the Arabian Sea.

No notice has been taken here of the storms of the south-west monsoon which form at the head of the Bay. Their influence on the weather in the south is very indirect. They may strengthen the Bombay monsoon as they travel westward and the influence of this has been already considered.